ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION

FEBRUARY 19, 1948

SURVEY AND FORECAST NUMBER

EDITORIAL PERSPECTIVE

INVENTORY OF MAJOR PROJECTS

CONSTRUCTION BUSINESS TRENDS

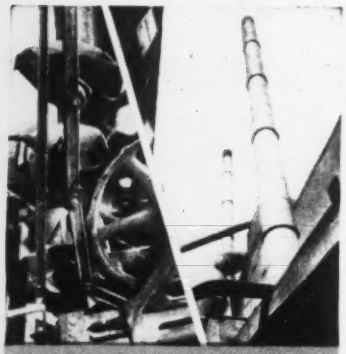
FOREIGN PLANS AND PROSPECTS

WHERE WE STAND ON HOUSING

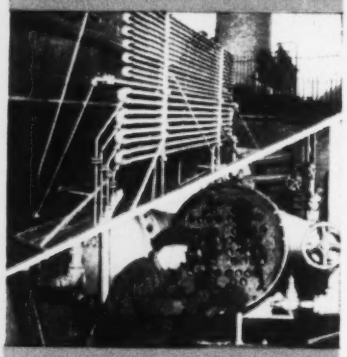
TO CURB EXCESSIVE MAINTENANCE

use BYERS WROUGHT IRON

IN THESE CORROSIVE SERVICES



FLUES & FUEL HANDLING EQUIPMENT



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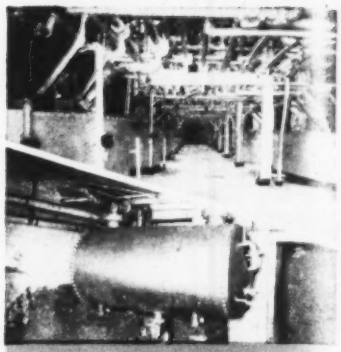
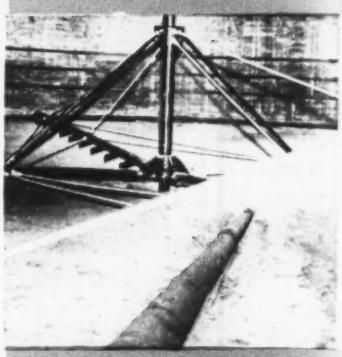
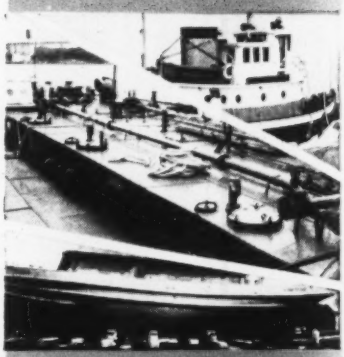


PIPING OR TANKS

RADIANT HEATING, SNOW MELTING, OR SKATING RINKS



TREATMENT OF SEWAGE OR WASTE



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Corrosion costs you more than wrought iron

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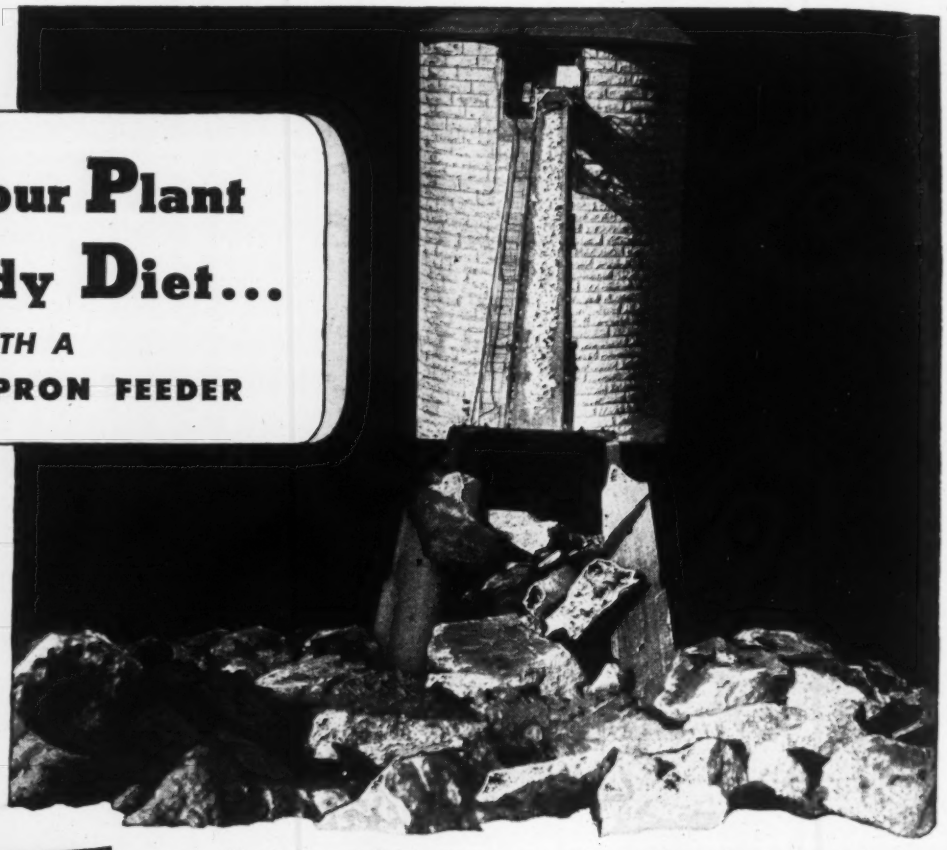
Give your Plant a Steady Diet...

WITH A

PIONEER APRON FEEDER



Maximum production in quarry, pit or mine calls for a *steady flow* of material to crushers, screens and conveyors. Because the feeder controls the flow of material throughout the entire plant, it is recognized as the *most important single factor* in determining cost of material per ton.

When the North Carolina Granite Corporation at Mount Airy, North Carolina laid plans for converting waste granite into road stone and concrete aggregate, a 14'x42" Pioneer Apron Feeder was included in their plant. Now 26 foot side dump railroad cars hurl huge chunks of granite into the specially constructed hopper. And . . . the tough Pioneer Apron Feeder starts it flowing at 100 tons an hour.

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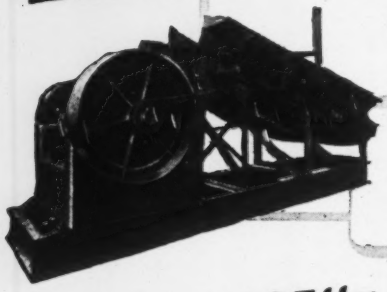
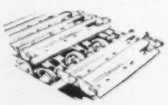
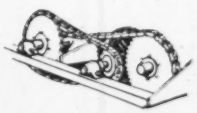


● Pans are ½" thick forged steel plate formed to overlap for great strength and rigidity.



● Cut-steel sprockets in the compact, efficient arrangement of the reduction gear reduce maintenance costs, save chain wear.



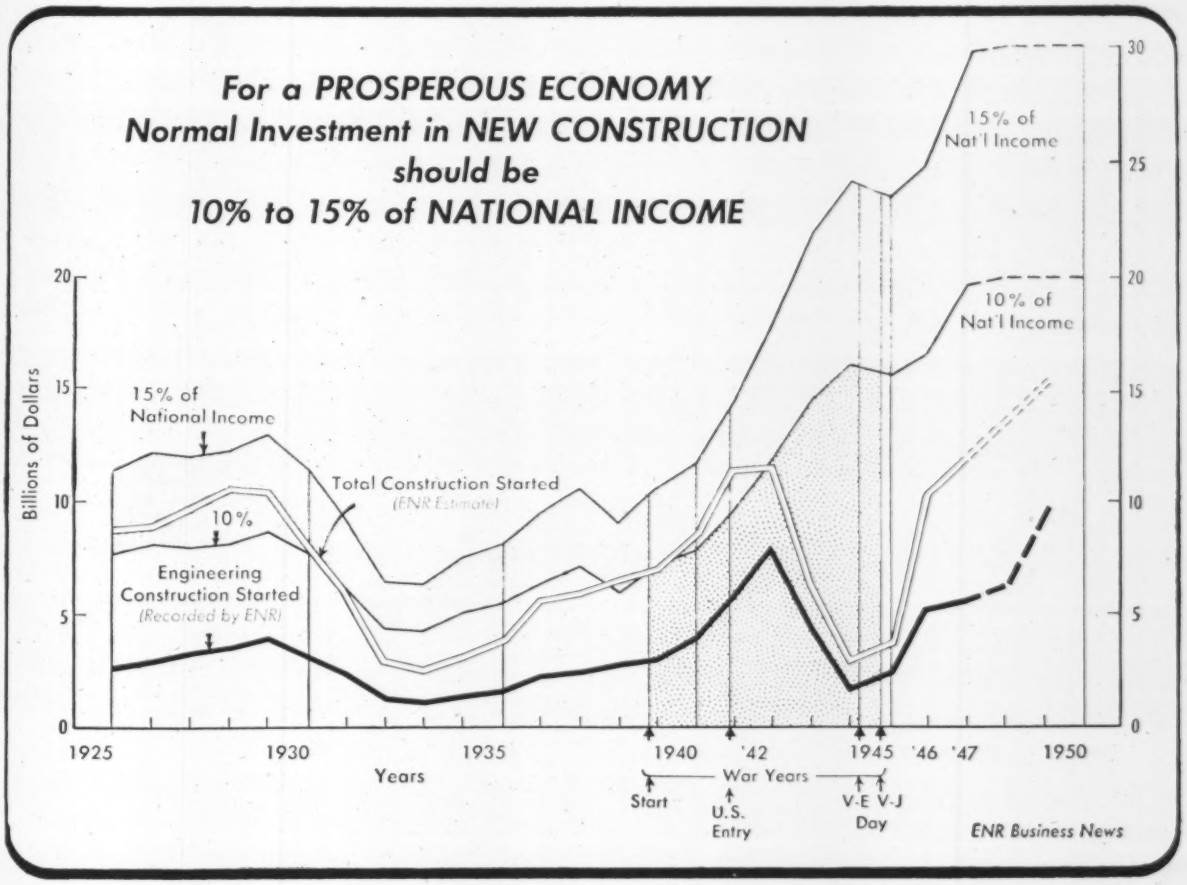
BUY BOTH—

Higher Output, Lower Upkeep!

Pioneer

Continuflo EQUIPMENT

Construction Trends



Construction Ratio to Income Still Low

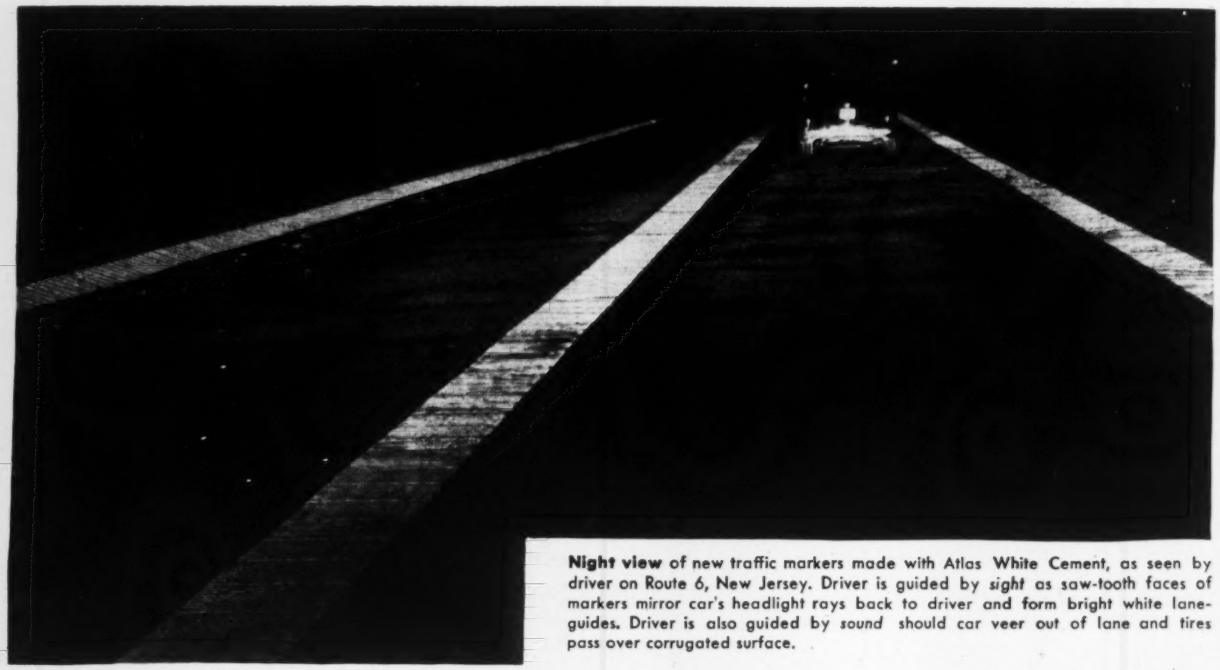
Engineering News-Record's 1947 estimate of total construction volume in the United States is $12,000,000,000, 6 percent of the national income of approximately $197,000,000,000. This compares with *Engineering News-Record's* 1946 estimate of $10,350,000,000 for total construction, which was also 6 percent of the national income of $165,000,000,000.

The 1948 forecast of total construction in the U. S. is placed at $13,500,000,000, an increase of 12.5 percent over the 1947 estimate. Assuming a national income of $200,000,000,000 for 1948, the construction curve for 1948 will still be equivalent to only 7 percent of the national income.

A prosperous peacetime economy is accompanied by a volume of construction which averages from 10 to 15 percent of the national income. Thus, a national income of approximately $200,000,000,000 could support a volume of construction equal to at least $20,000,000,000.

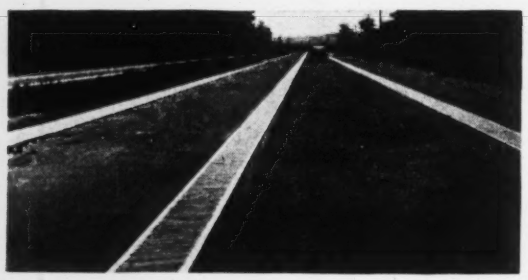
A dollar volume of construction above the 10 percent mark was attained during the pre-depression years of 1925 through 1929 and during the years of heavy war construction from 1939 through 1942. During these years, 1925 through 1942, inclusive, the curve of the volume of new construction followed the trend of the national income.

In the succeeding three years, construction activity declined from the 1942 peak of $12,821,000,000 to $5,000,000,000 in 1943, to $2,900,000,000 in 1944 and to $3,793,000,000 in 1945 while the national income dominated by war production continued to rise from approximately $122,000,000,000 in 1942 to $161,000,000,000 in 1945. During these years, new construction in continental United States was equivalent to only 2 to 3 percent of the national income.

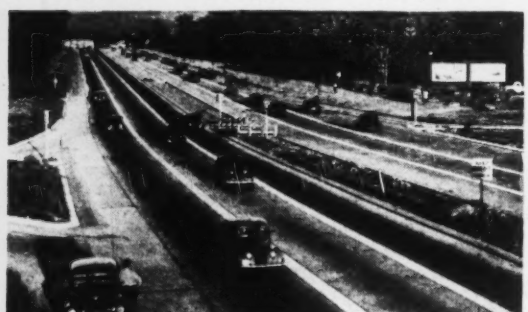


Night view of new traffic markers made with Atlas White Cement, as seen by driver on Route 6, New Jersey. Driver is guided by *sight* as saw-tooth faces of markers mirror car's headlight rays back to driver and form bright white lane-guides. Driver is also guided by *sound* should car veer out of lane and tires pass over corrugated surface.

Now...this highway HUM-M-M-S with safety



Daytime view of same traffic markers shown above. Note contrast of Atlas White Cement against regular pavement gray. (White Concrete Reflecting Curb at left.)



Overall view shows high visibility of traffic markers—how markers channelize traffic—and keep cars in their own lanes.

New Double-duty Traffic Marker

Guides Drivers by Sound and Sight both Day and Night

Here's a new idea in highway safety! A traffic-lane separator that does double safety duty! The driver can *see* it and *hear* it—both by day and by night!

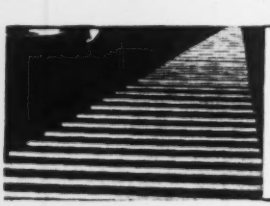
Made with Atlas White Cement, this new traffic marker has a corrugated surface and is built flush with the highway level. By day, in contrast with familiar pavement gray, its white visibility is high. By night, independent of overhead illumination, its saw-tooth faces catch the car's headlight rays and reflect them back to the driver in a gleaming ribbon of white.

In addition, day or night, the slight surface elevations and depressions of this traffic marker cause a distinct hum, or warning whine, when tires pass over them if the driver should veer out of lane.

Thus, the bright white color and the slant-ribbed surface do double duty—guiding the driver by sound and sight, both day and night. Traffic is channelized, moves faster, safer. Highway capacity is increased.

Send for new descriptive booklet. Write to Atlas White Bureau, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

ENR-TM-1



ATLAS WHITE CEMENT

for Double Duty TRAFFIC MARKER

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—ABC Network*

News of the Week

ENGINEERING NEWS-RECORD • FEBRUARY 19, 1948 • VOLUME 140 • NUMBER 8

AGC ratifies new agreement to end jurisdictional fights

Counsel for National Labor Relations Board tells contractors that industry is definitely under Taft-Hartley act—D. W. Winkelman seated as new president

Ending a 3-day meeting dominated by the pressing problem of labor relations, the Associated General Contractors closed their annual convention at Dallas, Texas, last week, with ratification of a new plan aimed at ending jurisdictional disputes.

The ratification—covering a joint program worked out with the Building Trades Department of the American Federation of Labor and seven national organizations of specialty contractors—capped a series of meetings at which contractors were told of their obligations under new national labor laws, and heard discussions of other problems of their industry. At closing sessions, the delegates watched seating of Dwight W. Winkelman, of Syracuse, N. Y., as new president of the organization.

The jurisdictional dispute settlement plan—presented to the convention by Richard J. Gray, president of the Building Trades Dept of the AFL and Carl Jansen, AGC labor relations committee chairman—was ratified by the specialty contractors at Washington on Feb. 10, and will be acted upon by the AFL by March 8.

It contemplates establishment of a national joint board composed of an impartial chairman, two labor and two contractor members and a pool of 24 members representing labor and employers to be available for arbitration. A board of trustees, made up of the board chairman, four labor and four contractor representatives, would receive notices of disputes, determine if the facts warrant board consideration or abitration, and also determine if any previous decision would apply to the dispute. Decisions of the board would be binding only on the firms signing agreements to work under the plan.

Most important feature of the agreement is that work must continue during the consideration of the dispute. Costs would be borne equally by unions and contractors, and the plan specifically does not upset existing arrangements for local settlement of disputes such as prevail in New York, Boston and Chicago. Edward P. Palmer of New York and J. D. Marshall, assistant AGC managing director, were appointed as members of the board.

The specialty contractors who ratified the plan in Washington include painting and decorating contractors, the National Association of Master Plumbers, Contracting Plasterers' International Association, the National Electrical Contractors Association, the Tile Contractors Association, Heating, Piping and Air Conditioning Contractors Association, and the Sheet Metal Workers International Association.

Any doubts about construction coming within the scope of the Taft-Hartley law were dispelled by Robert Denham, general counsel of the National Labor Relations Board, who told AGC members that the act's coverage of everything affecting inter-state commerce "leaves no question" but that the entire construction industry is subject to the act.

Denham pointed out that construction has always been under the jurisdiction of NLRB, but said that under the Wagner Act it was never obligatory for the board to enforce the law's provisions. "Wording of the Taft Hartley Act," he said, "leaves no alternative but to include construction."

The attorney explained that administration of the act for the construction field would be most difficult because of the peculiar nature of the industry, and said he had asked and is receiving "full cooperation" from contractors and organized labor in setting up administrative procedure.

Most perplexing problem, he said, is establishment of election procedure as demanded by the act to determine proper bargaining units. NLRB is planning area elections that will include all unions and contractors that

(*Continued on page 92*)

House approves $459 million for PRA

The House of Representatives last week approved the provision of more than $459,000,000 for the Public Roads Administration, when it passed the Independent Offices Bill (H. R. 5214). As finally approved, the House measure cut $56,000,000 from President Truman's original request.

This total is only $1,000,000 less than that requested for PRA by President Truman in his annual budget message. (*ENR* Jan. 15, 1948). PRA funds include $452,288,000 to be spent in accordance with the 1944 Federal-Aid Highway Act, $7,300,000 for elimination of grade crossings, and $70,000 for completion of access road projects.

The Bureau of Community Facilities, another constituent agency of the Federal Works Agency, received only $896,250 for construction. That money is earmarked for public works construction in the Virgin Islands. The House failed to follow the president's recommendation that the agency be given $20,000,000 for local public works advance planning.

For the Public Buildings Administration—the other constituent agency of FWA—the House allowed $500,000 in cash and $19,500,000 in contract authority for construction of a hospital center in the Washington, D. C. area.

Some $10,000,000 in cash and $18,200,000 of contractual authority is supplied for the National Advisory Committee for Aeronautics. This money, which will be spent for construction of research facilities, was considerably less than the President sought.

Early consideration of the bill by the Senate is anticipated. The total of the bill is over $991,000,000, which is $56,000,000 below the budget request but $196,000,000 above the appropriation for the present fiscal year.

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Construction—The *North Dakota* department of health has reviewed plans for new hospitals in that state to provide 325 beds at a cost of $2,225,000. . . . Fish Engineering Co. has started work on a $2,000,000 gas plant addition at *Kilgore, Tex.*, for the Humble Oil & Refining Co. . . . A $12,000,000 sulphate pulp mill will be built on the east coast of *Vancouver Island, B. C.* by H. R. MacMillan Export Co. Plans are being prepared by H. A. Simons, Vancouver, B. C., consulting engineer.

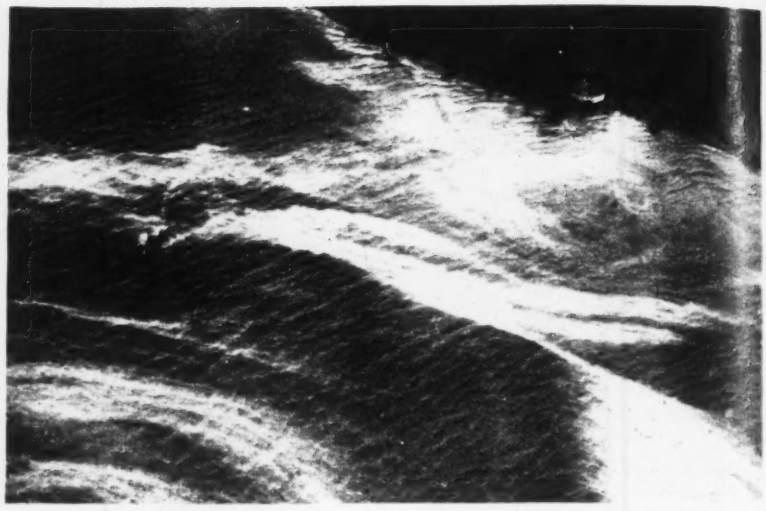
Highways—A one-cent per gallon increase in the *Massachusetts* gasoline tax has been proposed to provide for snow removal and highway maintenance. Town mayors and selectmen favor the move, which is opposed by the Highway Users Conference. . . . State and federal aid is to be sought for rebuilding a 13-mile stretch of roadway and seawall washed out by the hurricane of last September in *Hancock County, Miss.* . . . A 6-lane, $6,000,000 expressway from downtown *Kansas City, Mo.*, to the Johnson County line will be built this year. . . . Voters of *Dallas County, Tex.*, have rejected a proposed $11,426,000 bond issue to finance improvements on 60 bridges and 24 roads. . . . Engineering surveys for a four-lane highway from *Harrisburg, Pa., to Baltimore, Md.*, will get under way this year.

Housing—A $2,500,000 apartment project is planned near York Road and Walker Ave., *Baltimore, Md.*, involving 19 garden-type buildings with 254 units. . . . *Newton, Mass.*, will build 100 homes for veterans. . . . Construction of a 54-unit apartment project in Shorewood, *Milwaukee, Wis.*, will be begun soon. . . . Apartment developments recently announced for *Dallas, Tex.*, and suburbs include call for expenditure of more than $7,000,000. . . . Federal Housing Administration and the Berkshire Life Insurance Co., Pittsfield, Mass., will finance construction of the first large apartment house project in *Springfield* in 15 years. Plans call for a 160-unit apartment with 55 garages to cost $1,775,000.

Sewers and water supply—L. E. Dixon Co. has been awarded a $2,592,000 contract for enlargement of a softening and filtration plant of the Metropolitan Water District of Southern California near *LaVerne, Calif.* . . . Laying of an additional 10-inch main from the *Huntington, Ind.*, waterworks plant into the city and erection of a 500,000-gallon storage tank are main objectives of the long-range improvement plant.

Labor—*Columbus, Ohio*, has authorized time and one-fourth pay for overtime of planning engineers to expedite the city's multimillion dollar sewer and street construction program. . . . Walkout of 165 union electricians in *Wilmington, Del.*, ended Feb. 6 when they got a 15-cents-an-hour increase to $2.25. . . . Eight AFL building crafts unions at *Houston, Tex.*, got a dollar a day wage increase on Jan. 28. . . . Employees of the *Sandusky County, Ohio*, engineering department won a 10 percent wage boost recently.

Miscellany—A contract for most of the work in relocating a section of the Great Northern Railway in the Cascade Mountains of *Washington state* has been awarded to the Morrison-Knudsen Co., Inc., of Boise, Idaho. . . . A $4,728,000 flood control plan for the Frankford Creek area in Philadelphia, Pa., has been recommended by the Knappen Engineering Co. of New York.



U. S. Navy photo (NARTU) Sands Point Naval Air Station

***Tell-Tale Sewage**—Using the technique for what may be the first time for civilian agencies, public health officials of Seattle, Wash., recently dumped quantities of fluorscine—known as "tell-tale green" by Army flyers—into the boil at the mouth of the city's north trunk sewer outfall in Shilshole Bay. The color—which persists for about three hours—showed clearly the effects of tides and currents that bring the discharge back near the shoreline and then out to sea (at right). In the first test, a half-pound of fluorscine was poured into the boil every half-hour for a period of several hours. The work is part of a program being carried on by the city and state health departments and the state pollution control board*

Engineer named executive head of D&RGW

Election of Edward A. West as executive vice-president and of Alfred E. Perlman to succeed him as general manager of the Denver and Rio Grande Western R. R. has been announced. K. L. Moriarty succeeds Mr. Perlman as chief engineer.

Mr. West is a graduate of Massachusetts Institute of Technology. At one time he was chief engineer of the Denver, Colo., Tramway Co. Mr. Perlman is also an MIT man, and in 1935 became assistant engineer of maintenance of way for the Burlington. Mr. Moriarty entered railroading with the same line in 1917 as a surveyor.

Expand porcelain-enamel home production capacity

The Lustron Corp., Columbus, Ohio has placed additional orders of $2,079,617 in plant equipment for the manufacture of porcelain-enamel steel homes. During the last two months similar orders totaling $5,455,433 have been placed by the corporation.

Lustron officials said they expect to produce 17,500 homes in 1948, and 40,000 in 1949.

Canadian builders review business, elect officers for coming year

Canadian Construction Association elects Alan C. Ross as president—Hears report of billion dollar-1947 business

During 1947, the Canadian construction industry carried out more than one billion dollars worth of work in one year for the first time in the dominion's history, members of the Canadian Construction Association were told at their recent thirtieth annual general meeting at Quebec City.

During the 3-day meeting, Alan C. Ross, president of Ross-Meagher, Ltd., general contractors of Ottawa, was elected president, succeeding Albert Deschamps of Montreal.

Canadian government officials told the group that the government's estimate of more than a billion dollars worth of construction in 1947 included work done but not completed by contract and so not included in published figures of contract awards.

Few strikes reported

The government men also paid tribute to the industry for its unusual labor record, with practically no strikes at all during the war years, less than ten strikes in each of 1945 and 1946, and with only 6,000 men involved in all work stoppages through all of 1947.

Speaking of labor matters, J. M. Pigott, chairman of the apprenticeship committee, said that there are now about 16,000 apprentices at work in the building trades in Canada, five-sixths of them being veterans who are assisted in their work by the government. He said that eight of the nine Canadian provinces now have departments or offices in charge of apprenticeship work, and pointed out that the Dominion government participates in this work.

Humphrey Mitchell, Minister of the Labor Department, told of arrangements for bringing European displaced persons to work in Canada with the agreement of trade unions and industries. Mr. Mitchell said that 1000 skilled tradesmen are to be brought in, to work first at laborer's rates until they become accustomed to Canadian conditions; and 2,500 laborers are also to be brought in, principally for work with the Hydro Electric Power Commission of Ontario on its major jobs.

Discuss research council

Robert F. Legget, of Ottawa, described the start of the work of the new Division of Building Research of the National Research Council. Explaining that the council is now an active operating organization with a staff of 2500, Mr. Legget outlined the continuing interest of the council in construction matters, including its joint sponsorship of the national building code of Canada—now to be administered by the new division.

Mr. Legget's talk also described building research organizations in other countries and outlined the general objectives of his group.

Other speakers included Robert Drummond, of Toronto, who said that the material supply situation will improve greatly during the coming year through cooperation of manufacturers and supply houses; J. L. E. Price, of Montreal, who commented that since V-E day only 10 percent of houses completed in Canada have been sold for rental at $35 per month or less and suggested subsidy housing in the low cost field; and Mr. Ross and Mr. Deschamps.

Concurrent sessions of the four sections of the association—general contractors, trade contractors, road builders and manufacturing and supply—produced a number of resolutions, including one calling for the creation of a "shelf" of public works projects.

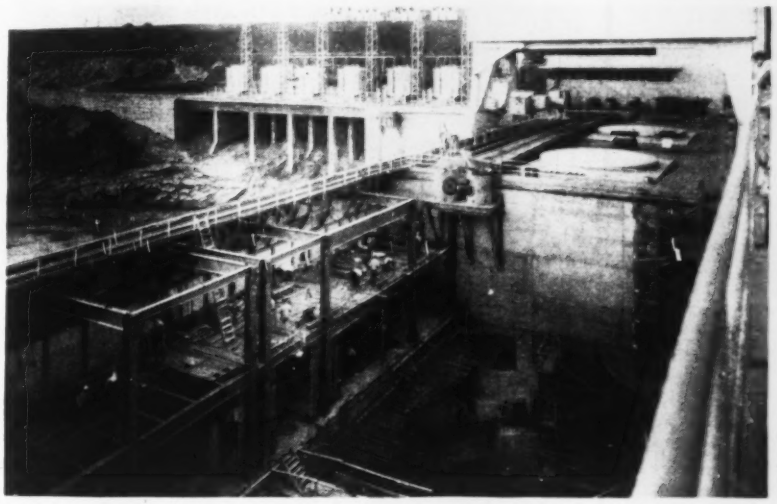
CAA announces details of $1 billion airport plan

A $1,048,500,000 national airport plan, listing 4,835 locations at which the existing and anticipated demands for air service indicate that airports should be constructed or developed during the next three years, was announced last week by T. P. Wright, administrator of the Civil Aeronautics Administration.

A total of 2,745 completely new airports are called for, while 2,090 projects are existing airports requiring additional improvement or development. Of the estimated cost, $468,700,000 would be federal aid and $578,800,000 from local matching funds.

The new plan was prepared in accordance with the provisions of the Federal Airport Act of 1946 (*ENR* May 16, 1946, vol. p. 763). This law requires that the CAA administrator annually revise the existing national airport plan and prepare a forecast of projects necessary to provide an adequate system of public airports.

Some 502 class IV or larger airports, of which only 17 are entirely new fields, are listed in the revised plan. Of the 575 class III Airports listed, 155 are new projects, and 537 of the 1,109 class II Fields listed would be new construction. Of the 2,321 class I fields in the plan 1,752 are new construction. Also included in the plan are 291 seaplane bases, of which 264 would be new construction.



***Final Fort Loudon Installation**—The last two 32,000 kw. turbines and generators are now being installed to complete the Tennessee Valley Authority's $58,700,000 Fort Loudon Dam project on the Tennessee River. First unit in the huge powerhouse went on the line in November, 1943, and the second in January, 1944. The two new units are expected to be in operation by early fall.*

AGC OK's jurisdictional dispute pact

(*Continued from page 89*)

have bargained jointly in the past, with contractors furnishing lists of all employees during the past year and a special board screening out workers regarded as steady employees qualified to vote. Mr. Denham said that the Pittsburgh area has been selected for a test of details of the election procedure.

Speaking before the group ratified the jurisdictional plan, Mr. Denham pleaded for its adoption, pointing out that under the Taft-Hartley Act, the NLRB must settle jurisdictional disputes that labor and contractors cannot settle. "The board knows little about construction," he added, "and the industry and its workers would be much better off if it handled its own disputes. However, the board will not hesitate to settle such disputes, if necessary—very likely to the detriment of all concerned."

Military units sponsored

At their Des Moines, Iowa, meeting last September AGC members agreed to sponsor 100 engineer construction units for the Corps of Engineers, under the Army affiliated unit program. Already 63 chapters and branches have signed up to sponsor 64 units. Three have been activated—the 431st Engineer Construction Battalion at Corpus Christi, the 432d at Houston, and 433rd at Detroit. Col. Robert J. Fleming, Jr., heading up the program for the Chief of Engineers, expressed amazement at the speed in which the contractors are getting under way, remarking that the Army is having hard time catching up with developments.

Contractors look for a $15,000,000,000 volume in new construction and $6,000,000,000 in maintenance and repair for 1948. Some signs of cost stabilization were reported, although the general trend is still slightly upward with no signs of immediate sharp decreases. Labor is becoming more plentiful but shortages remain among bricklayers, plasterers and plumbers, the meeting heard.

Papers prepared by Thomas H. MacDonald, PRA chief; Lieut. Gen. Raymond A. Wheeler, Chief of Engineers; Adm. J. J. Manning, Chief of the Bureau Yards and Docks, and Walker Young, chief engineer, Bureau of Reclamation, all outlined construction prospects in their agencies, and urged continuing programs to stabilize planning and engineering.

The AGC reaffirmed its previous decision not to ask for escalator clauses on heavy construction projects running under two and half years, leaving longer jobs subject to negotiation on that matter. On this subject Walker Young stated that if contractors expect awarding agencies to take too much of construction risk there will be no need for contractors.

Dwight W. Winkelman, Syracuse, N. Y., was elected president for 1948. A. Teichert, Jr., Sacramento, Calif., was chosen vice-president. Division

DWIGHT W. WINKELMAN
. . . heads AGC group

chairmen are Geo. C. Koss, Des Moines, Ia., Highway; S. A. Fuller, Pittsburgh, Heavy; and A. L. Atherton, Seattle, Building. The AGC board voted to eliminate the usual spring board meeting but to continue the fall board session. Next annual meeting will be in New York.

First building-trade vote to be at Pittsburgh

The first union-shop election in the construction industry will be held among teamsters, operating engineers and one other craft employed by members of the Constructors Association of Western Pennsylvania, the National Labor Relations Board said last week.

NLRB General Counsel Robert N. Denham said this group was selected for the pilot election because—involving only three crafts and one employers' association—it is a "rather simple test." The mechanics of the election are now being discussed in Pittsburgh between representatives of NLRB, the association and the unions.

It is Denham's plan to take on the more difficult elections as experience is gained through the simpler ones. Consideration is being given to an election in an urban area in New York.

Concrete deterioration studied in Alabama

Research to determine the cause and extent of deterioration in concrete resulting from high alkalinity of cement and reactive aggregate is to be undertaken by the testing laboratory of the Alabama State Highway Department. Concrete placed in recent years in Alabama and nearby states, particularly in structures, has in some cases deteriorated rapidly, while older concrete remained sound.

All aggregates found in the state as well as brands of cement are being classified. Bars will be made of the different mixes for freezing and thawing, wetting and drying, and thermal expansion tests. The theory that if the active materials are evenly distributed there will be no deterioration will be tested by grinding the test bars to sand with a controlled screen.

The laboratory is also making high sodium and potassium content cement and mixing it with both high and low reactive aggregate to test if sodium silicate is the cause of disintegration of cement.

Penna. appeals court bar of street widening plan

The State of Pennsylvania has asked the U. S. Circuit Court of Appeals to overrule a lower federal court decision that the state is subject to the Federal Housing Rent Control law of 1947.

The ruling by Federal Judge Guy K. Bard has impeded the State Highway Department's $13,000,000 project for widening Vine Street, Philadelphia, to the Delaware River Bridge.

The issue revolves about the attempt of the state to evict occupants of four state-owned homes in the neighborhood of 8th and Vine streets that have to be torn down to complete the bridge approach.

Tennessee begins survey of sewerage systems

Municipal and industrial officials in Tennessee are being asked to cooperate in a new study of sewerage and industrial waste system being conducted by the State Stream Pollution Control Board as a preliminary to a broad state pollution-control program.

R. P. Farrell, director of the sanitary engineering division of the State Health Department, said that this would be the first complete survey of sewerage and industrial waste systems there since 1929.

Urge $1.4 billion building program to revamp Michigan highway system

State road groups conclude 18-month survey of state's needs with recommendation for 12-15 year program

Michigan's 106,000 miles of roads and streets have deteriorated to the point that $1,400,000,000 must be spent for new construction, in the next 12 to 15 years, the Michigan Good Roads Federation said last week.

The report is to be submitted to a special session of the state legislature along with a supplementary report containing more specific recommendations.

The 18-month study closely paralleled a similar survey made in California more than a year ago (*ENR* Nov. 7, 1946, vol. p. 609) and employed some of the same personnel and study organizations. The recommendations of the California survey later were enacted into law which launched the state on a $2,300,000,000 highway program (*ENR* July 10, 1947, vol. p. 21).

The Michigan group broke down its summary of needed construction into two major categories: $773,463,000 for rural highways, and $661,500,000 for urban streets and highway connections. Of the figure for rural road work, $475,500,000 should be spent for state trunk-line roads, $172,600,000 for primary county roads, and $125,300,000 for local farm-to-market roads. The urban work would be divided to give $404,000,000 for state trunk roads; $21,700,000 for county roads; $118,000,000 on major streets, and $117,000,000 on other streets.

In addition to these expenditures, the federation reported that the state would be obliged to spend about $700,000,000 over the period of the program for maintenance and improvement.

Seek new revenue sources

Stating that the present tax structure for highway use would not supply the funds for such an extensive program, the federation report urged either increased gasoline taxes, motor vehicle fees, local property taxes, or a combination of the three.

First requirement for a proper financing program should be repeal or amendment of existing laws governing distribution of highway revenues, with an eye toward placing primary responsibility for financing local county and city roads on the local tax structure. This would leave state-collected revenues to be spent principally on general-service, state trunk-line highways, primary county roads and major city streets.

A corollary of such a program should be state-wide coordination of highway administration, which might include a requirement that counties and municipalities submit annual improvement programs to the state highway commission for approval, the report said.

The federation concluded that if these changes were made in the basic structure, plus distribution of state-collected funds on a formula of greatest need, an increase of 2.2 cents per gallon on the state gasoline tax would be sufficient to make up existing deficiencies over a 12-year period provided there is complete local support for local roads. It was estimated that annual expenditure on the 12-year program would approximate $179,000,000.

Many aid in study

The Good Roads Federation itself a group of highway-user organizations—was aided in the study by the Public Roads Administration, the National Safety Council and the Bureau of Governmental Research of the University of Michigan.

J. P. Buckley of Lansing, who completed the California survey a year ago, served as engineer-director for the federation, working under the direction of Otto S. Hess, a civil engineer and federation president.

Roadbuilding costs continue to climb

During the last quarter of 1947, highway construction costs continued to climb, figures released this week by the Public Roads Administration revealed. The composite mile index rose to 146.7 for that quarter or to the highest point it has been since the index was put into effect in 1925.

The fourth quarter figure is an appreciable climb over the 142.9 figure for the third quarter (*ENR* Jan. 1, 1948 vol. p. 11), and it brought the 1947 average to 140.4, which is the highest yearly average ever recorded and which compares with 122.9 for 1946.

The 100 base for the index is the average cost for work in the period 1925-29. It is assumed that one mile of construction involves 17,191 cu. yd. of excavation, 3,726 sq. yd. of paving, 16,000 lb. of reinforcing steel, 1,325 lb. of structural steel, and 68 cu. yd. of structural concrete.

PRA officials have also announced that federal-aid highway construction projects awarded by the state highway departments during the fourth quarter call for an expenditure of $174,869,000, of which about $94,000,000 will be federal funds. During the same period, awards were made by the departments for $52,000,000 of construction financed without federal assistance. Including both types of work, contracts calling for a total of 7,241 miles of road were awarded in the fourth quarter, which brought the 1947 total to nearly 45,000 miles.

Building men complete basic code edition

The Building Officials Foundation has announced completion of the industry-review edition of a basic building code, prepared by the Building Officials Conference of America, Inc. Distribution of the code to organizations concerned with building standards has started.

The current edition of the code is not intended for immediate adoption by communities.

The arrangement of the basic code follows the recommendations of the American Standards Association, with the addition of articles covering refrigeration and prefabrication. It incorporates functional performance requirements.

Industry groups will be asked to review the code by April 15 after which the code will be issued in such form as it might be adopted by communities, and detailed specifications so that manufacturers, architects, builders and others can interpret its provisions readily.

Plan 1st Inter-American conservation meeting

The first Inter-American Conference on the Conservation of Renewable Natural Resources will be held at Denver, Colo., Sept. 7 to 20 of this year. Planned by the governing board of the Pan American Union and the U. S. State Department, the conference is being held pursuant to a resolution adopted at the Third Inter-American Conference on Agriculture held at Caracas, Venezuela, in July 1945.

Flood control, soil erosion, protection of water supplies, and similar problems will be studied at the convention.

Warren Kelchner, chief of the division of international conferences, U. S. Department of State, is executive vice president of the conference, and William Vogt, chief of the conservation section of the Pan American Union, secretary general. An organizing committee composed of representatives of interested government agencies has been established to co-ordinate arrangements for the conference.

San Diego offers land for low rent housing

City-owned land, improved with sewers, water, streets and walks, would be for sale at cost to investors for low rental housing developments, under a plan now under consideration by the San Diego, Calif., city council.

Mayor Harley E. Knox made the suggestion in the council as one way of getting the kind of housing the city needs most. "Good houses could be constructed to rent for $45 to $50 a month," the mayor said.

San Diego owns several large tracts of land suitable for mass production building. It is believed the land could be offered for half the cost usually paid by builders, thus removing one of the main obstacles to low-cost housing.

An effort would be made to interest a syndicate of local capital to undertake the housing program.

Restudy flood control in Illinois River basin

Restudies of a comprehensive flood control plan for the Illinois River Basin, prepared by the Corps of Engineers in 1945, are being started by the Chicago District, to be completed about July 1. The new studies were ordered after a hearing in Springfield, Ill., showed serious opposition to certain features of the plan by various agricultural, urban and conservation interests, particularly in the Sangamon River valley.

The existing plan calls for construction of detention reservoirs, 10 in the Sangamon Basin. The new studies will determine whether the proposed reservoirs can be modified to overcome opposition raised by local interests.

High costs to postpone Phila. bridge or tunnel

The Delaware River Bridge Commission, which supervises operation of the Delaware River Bridge between Philadelphia and Camden, was told last week that high construction costs rule out construction of either a new bridge or a vehicular tunnel for another eight or ten years.

Joseph K. Costello, general manager, told commissioners that the replacement cost of the existing bridge would be about $100,000,000, although the structure was built in 1926 at a cost of $37,000,000.

Higher costs, Costello said, would make the project economically infeasible.

Heater—Radiant heating through low-voltage, high-current power in a ½ in. plow steel cable is being installed in a number of new homes in Northern California. Cost of the system is about 70 cents per sq. ft. of house area, and heating costs (assuming power at one cent per kw.hr.) is estimated at 15 to 22 cents per hour. In installation above, a 4-in. concrete slab has been poured and covered with a fibreboard, to which the cable is stapled. A 2-in. surface slab is then poured. About one foot of cable length for each square foot of floor area is used and special thermostats keep cable temperature below 120 deg. F., and room temperatures at from 70 to 74 deg. F. Installations are also made in wood floors, using dry sand to cover the cables. A patented system is marketed by Tice Electric Co., Monterey, Calif.

Test new-type panel for wall construction

Two successful preliminary fire tests and a structural test have already been made on a new type of wall panel made of insulating material covered with stainless steel, according to the Office of Technical Services of the U. S. Department of Commerce.

Wind load tests already completed have satisfied the requirements of the New York City building code and the Housing and Home Finance agencies.

The panel, known as a spandrel wall construction system, was originated in research conducted by Davison Associates, consulting engineers of New York City. It is a light, steel frame unit about 4 ft. square and may be built of several materials in either 3- or 4-in. thicknesses to meet requirements of local building codes.

Present specifications for the standard panel call for cold-rolled steel frame and 24-gage steel faces, with a core sodium silicate binder or asbestos or glass fiber with a foam binder.

Los Angeles County acts against industrial "smog"

In the first action against a major industry under Los Angeles County's smog-control program, (*ENR* Nov. 27, vol. p. 718) Dr. Louis C. McCabe, head of the smoke program, recently filed a petition for revocation of Columbia Steel Co.'s smoke-control permit at its Torrance, Calif., plant.

Dr. McCabe, director of the county smog control district, declared he filed his petition after conferences with the district attorney and accused the plant of making "no effort whatever" to correct air pollution. J. Lester Perry, president of Columbia Steel, denied McCabe's charges.

He cited the purchase of new diesel equipment to replace steam switch engines, an electronic eye to detect smoke from the galvanizing tank, and an employee-training in control of smoke.

Central Valley project earned $3.6 millions

Sales of Central Valley Project power, plus rent from the Oroville transmission line, brought in revenues of $3,372,200 during 1947, most of which will be used to repay construction costs of the project, according to Regional Director Richard L. Boke of the Bureau of Reclamation at Sacramento, California.

In addition to power revenue, the project last year brought in $242,850 in revenues from the sale of domestic, industrial and agricultural water as well as minor revenues from grazing rentals and other items.

Revenues from all sources since Central Valley Project went into partial operation have totaled $11,724,065.24.

Reclamation bureau ups power production plans

A revised construction schedule for Bureau of Reclamation hydro-electric facilities that will add 2,948,000 kw. of generating capacity in the West by June 30, 1953, was announced recently by Secretary of the Interior J. A. Krug.

Mr. Krug said that the program would advance western river basin development and would ease pressure on critically short fuels by putting potential hydro-electric energy to use.

The revised program reflects a substantial increase over the work previously scheduled to June 30, 1952, which provided for addition of 2,269,000 kw. of capacity.

OBITUARY

William H. Gould, 69, for 15 years state agent for the Lake Erie Division of the Ohio Department of Public Works, died Feb. 1 in Toledo. He organized the Lucas County sanitary engineering department in 1913, said to be the first department of its kind in the United States. He served as Ohio's first state highway engineer in 1910-11. As a private engineer in 1929, he was retained by citizens of Maumee Bay to solve erosion problems, and was instrumental in enactment of erosion legislation.

E. Byron Martin, city engineer of Moncton, N. B., for the last 17 years, died Feb. 3. He had been been on the engineering staff for 35 years, and in the first world war he was with the Royal Canadian Engineers.

Mark E. Kelley, 63, of Peabody, Mass., a civil engineer and contractor, died Feb. 2 in Salem.

Albert C. Dove, 56, Ashland, Mass., for 35 years a designing engineer with the Metropolitan District Commission, died Feb. 1 in Boston, Mass. He was a graduate of Massachusetts Institute of Technology and a lecturer on engineering at the Franklin Institute.

Edgar S. Winters, 57, senior engineering aide for Tonawanda, N. Y., died recently in Buffalo. He was graduated from Dartmouth College in 1916.

William B. Griffin, 53, Stratford, Conn., manager of the Charter Oak toll bridge between Hartford and East Hartford, died Feb. 1. He previously was office manager of the Connecticut State Highway Commission. Following his graduation from Carnegie Institute he served with several manufacturing companies in Bridgeport, Conn.

H. F. Jonas, 80, a member of the firm of Jonas and Taylor, La Porte, Tex., died Jan. 31. Educated at Texas A. & M. College, he was one of the engineers who constructed the first causeway at Galveston. He served for some years as an engineer for the Southern Pacific Railway.

Claude Brown, 76, civil engineer, died at Zanesville, Ohio, Jan. 5. He was a member of the engineering department of the Baltimore & Ohio Railroad for many years and had also been in engineering and construction activities in and about Zanesville, including the Muskingum Conservancy District.

James R. Rumsey, 67, since 1944 assistant engineer of the Michigan Stream Control Commission, died at Grand Rapids recently. He started his career as city engineer for Michigan municipalities. From 1915 to 1918 he practiced sanitary engineering, designing and supervising construction of storm and sanitary sewer systems, sewage treatment plants, waterworks systems and water supply, and operation of plant. From 1927 to 1930 he was construction engineer for Grand Rapids, working on the sewage pumping station, interceptors, levees, bridges and assisting in design and construction of the sewage treatment plant. From 1930 to 1936 he was superintendent of the Grand Rapids sewage treatment works.

Prof. Edwin H. Wright, 74, former head of the Tufts College civil engineering department, died Feb. 6 in Somerville, Mass. Professor Wright, a practicing architect with the Boston firm of Putnam & Cox before joining the Tufts faculty in 1918, was graduated from Tufts Engineering School with honors in 1894. He was made head of the civil engineering department in 1926.

Edward Cowen Connor, Sr., 65, chairman of the Texas State Examining Board of Engineers, died at Dallas, Jan. 29. He was educated at the University of Texas, and had seen wide service in bridge and railroad engineering and public utilities construction.

Paul H. Douglas, 47, civil engineer associated with the Missouri State Highway Department, Jefferson City, Mo., died Feb. 8. He was graduated from the department of civil engineering, University of Illinois, in 1923.

MAJOR MEETINGS

National Association of Home Builders, Stevens and Congress Hotels, Chicago, Ill., Feb. 22-26.

American Concrete Institute, annual convention, Shirley-Savoy Hotel, Denver, Colo., Feb. 23-26.

Ontario Good Roads Association, 46th annual meeting, Royal York Hotel, Toronto, Ont., Feb. 24-25.

Association of Highway Officials of North Atlantic States, 24th annual meeting, Hotel Traymore, Atlantic City, N. J., March 3-5.

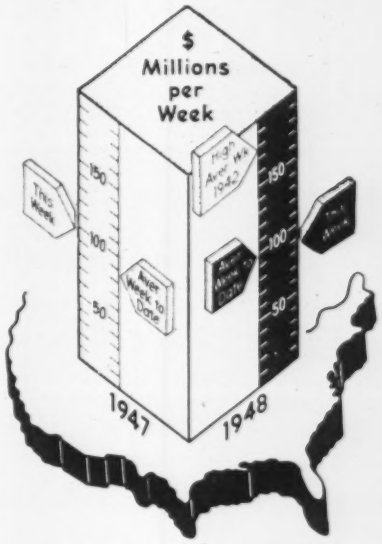
Mississippi Valley Conference of State Highway Departments, Edgewater Beach Hotel, Chicago, Ill., March 11-13.

American Concrete Pipe Association, Hotel Roosevelt, New Orleans, La., March 12-13.

American Railway Engineering Association, Palmer House, Chicago, Ill., March 16-18.

Chicago Technical Conference, Stevens Hotel, Chicago, Ill., March 22-24.

CONSTRUCTION ACTIVITY



As Reported this week to . . .
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

	Week of Feb. 19 1948	Cumulative 1948 (8 wks.)	Cumulative 1947 (8 wks.)
Federal	$14,892	$138,325	$67,595
State & Mun.	30,751	263,932	164,821
Total Public	$45,643	$402,457	$232,416
Total Private	42,912	385,400	463,341
U. S. Total	**$88,555**	**$787,857**	**$695,757**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Type of Work	This Week	Cumulative 1948 (8 wks.)	Cumulative 1947 (8 wks.)
Waterworks	$639	$28,068	$17,125
Sewerage	2,616	21,169	13,944
Bridges	5,314	28,332	18,848
Highways	8,328	97,462	63,039
Earthwork, Waterways	6,074	70,698	19,876
Buildings, Public	21,878	125,849	68,391
Industrial	9,067	106,899	124,087
Commercial	27,783	242,139	292,585
Unclassified	6,856	67,240	77,862

NOTE: Minimum size projects included are: Waterworks and waterway projects, $28,000; other public works, $50,000; industrial buildings, $68,000; other buildings, $250,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1948 (8 wks.)	Cumulative 1947 (8 wks.)
NON-FEDERAL	$354,221	$158,012
Corporate Securities	156,288	17,845
State and Municipal	197,933	140,167
Total Capital	**$354,221**	**$158,012**

ENR INDEX NUMBERS

Index Base	100	1913	1926
Construction Cost	Feb. '48	436.89	210.01
Building Cost	Feb. '48	329.71	178.23
Volume	Jan. '48	175	77

HEADLINE NEWS EVENTS OF 1947

(PAGE NUMBERS GIVEN IN PARENTHESES ARE VOLUME PAGES)

ENGINEERS and ENGINEERING

Chicago approves salary raises for engineering employees in line with recommendations made by ASCE (Jan. 9, p. 25)

ASCE annual meeting stresses need for more funds, corporate membership for juniors (Jan. 23, p. 95)

State highway officials urge equalization of all highway engineering employee salaries (Jan. 30, p. 177)

Senate group considers measures to define "professional" under Wagner Act (Feb. 13, p. 241)

Survey shows civil engineering students equal 11 percent of total engineering school enrollment (Mar. 13, p. 418)

Railroads urged to seek engineering recruits (Mar. 27, p. 471)

House bill would permit loan of United States engineers, technicians, to do work for foreign governments (May 15, p. 79)

Taft-Hartley Law passed, industry studies provisions; "professional engineer" defined. (June 5, p. 903)

ASTM approves rise in dues (June 26, p. 991)

California broadens registration law to include additional branches of engineering (July 17, p. 91)

ASCE to survey scientific manpower, backs universal military training (July 24, p. 97)

ASCE dues raise defeated, Juniors get voting rights (Oct. 23, p. 555)

Registration of engineers reported to total 114,698 (Nov. 6, p. 619)

Engineers' council plans to expand educational testing methods for guidance of prospective students of technical schools (Nov. 6, p. 632)

AEE reports results of 180-city study of municipal engineering wages (Dec. 4, p. 765)

Highway Research Board sees highway engineers scarce, underpaid (Dec. 18, p. 846)

HIGHWAYS

State highway officials point out need of immediate, large programs to keep nation's highway systems operating (Jan. 2, p. 6)

PRA in 1946 year-end review, sees road work lagging (Jan. 9, p. 27)

President urges appropriation of $27,000,000 to complete Inter-American Highway (Jan. 9, p. 23)

San Francisco Bay crossing—Army-Navy commission favors $261,000,000 low-level crossing (Feb. 13, p. 237) . . . California Department of Public Works recommends own plan for crossing (Feb. 27, p. 345) . . . California bridge board approves two crossings for San Francisco Bay (Nov. 17, p. 699)

House road committee favors extension of availability of federal-aid road funds (April 3, p. 487)

President seeks completion of Inter-American highway despite Congressional criticism on work accomplished so far (July 1, p. 79)

Public Roads Administration approves 40,000-mi. national highway system (Aug. 7, p. 165)

Pennsylvania Turnpike to be extended (Aug. 28, p. 287)

Maine Turnpike to cost $20,000,000, ready for opening in December (Sept. 25, p. 426)

Highway maintenance costs rise sharply (Dec. 18, p. 847)

LABOR

New York City builders, unions stabilize pay and end overtime under new agreement (Jan. 16, p. 89)

AFL building trades unions, AGC sign arbitration pact setting up machinery for voluntary settlement of disputes (Feb. 6, p. 181)

Unions attack Arizona, Nebraska anti-closed-shop laws (Feb. 27, p. 377)

Many state legislatures consider labor-control laws (March 13, p. 407)

New York governor signs bill outlawing strikes by public employees (April 3, p. 491)

Taft-Hartley law passed by Congress, provisions studied by management and labor (June 5, p. 903)

Nebraska state court upholds anti-closed-shop law (June 26, p. 993)

Arizona construction dispute settled by mutual agreement to arbitrate (Sept. 11, p. 360)

NLRB goes to courts to end building trades strikes (Dec. 18, p. 838)

New York builders, AFL agree on new plan to end jurisdictional strikes (Dec. 18, p. 839)

HOUSING

Government ends virtually all priority assistance in the construction field (Jan. 16, p. 82)

CPA lifts ceiling on non-residential construction to $50,000,000 worth of work weekly (Jan. 30, p. 161)

Congress considers Wagner-Ellender-Taft, and several other housing bills (March 27, p. 481)

All construction controls are shifted to Housing Expediter's office (April 10, p. 541)

Presidential message proposes consolidation of all government housing agencies (June 3, p. 909)

President signs new bill eliminating most controls on construction (July 10, p. 23)

Housing and Home Finance Agency created as new top housing agency under executive order (Aug. 7, p. 168)

National Association of Manufacturers report scores housing industry for inadequate, costly work (Dec. 11, p. 781)

DISASTERS

Experts blame all parties for disastrous fires in Chicago, Atlanta hotels (Jan. 30, p. 171)

Record floods reported on midwest rivers, southern Michigan hardest hit (April 17, p. 561)

Texas City, Tex., explosion and fire kills 400, causes $100,000,000 damage (April 24, p. 703)

Floods hit in Northeast. Three Vermont dams near Rutland fail simultaneously (June 12, p. 921)

Mississippi flood reaches 103-year record, U. S.-built levees hold firm against high waters in valley (July 10, p. 19)

MUNICIPAL AFFAIRS

Boston announces 10-year, $25,000,000 port expansion program (Jan. 2, p. 8)

Chicago revises hotel fire code following disastrous LaSalle Hotel fire (Jan. 16, p. 92)

New York City turns over its airports to bi-state Port of New York Authority (April 3, p. 490)

Transit authority takes over Chicago surface and rapid transit lines (Oct. 9, p. 497)

Newark, N. J., leases airport and sea terminals to Port of New York Authority (Oct. 30, p. 575)

San Francisco ready to take bids on $9,000,000 sewage works (Dec. 4, p. 787)

CONSTRUCTION BUSINESS

Construction tops $10 billion dollar-volume for 1946 (Jan. 2, p. 1)

President asks $1.4 billion for 1947 government construction, urges postponement of all deferrable work (Jan. 16, p. 75)

FWA reports local public works planning now totals more than $5.6 billion (Feb. 13, p. 235)

AED fears business effect of dumping armed forces-surplus equipment outside U. S. on local markets (Feb. 20, p. 257)

Congress approves large appropriations for federal construction, with flood control and river work getting greater share (July 31, p. 145)

See 1947 dollar-volume topping $12 billion as heavy construction shows steady increase (Oct. 30, p. 571)

CANALS and WATERWAYS

Expect Panama Canal report in time for Congressional action in 1948, with studies under way (Jan. 30, p. 175)

New St. Lawrence Seaway bill before Senate would approve 1941 U. S.-Canada agreements (May 8, p. 773)

Canada will widen and deepen existing St. Lawrence ship channel for larger vessels (Aug. 7, p. 167)

Sea-level canal recommended for Panama (Dec. 4, p. 765)

Panama Canal report submitted, details cost of three alternate programs (Dec. 11, p. 787)

SEWERAGE and STREAM POLLUTION

Allegany County, Pa., begins biggest unified sewage disposal program (Jan. 16, p. 90)

National Council for Stream Improvement opposes federal interference in pollution control efforts as being unnecessary (March 6, p. 353)

U. S. and Mexican sanitary engineers foster joint action on border sewage works (May 15, p. 795)

RECLAMATION

High costs force change in Arizona water project, eliminating plans for 78-mi. tunnel from Parker Dam (Feb. 27, p. 333)

Plans for 238 projects in Northwest call for expenditure of $5.6 billion (March 20, p. 421)

ASCE at Phoenix, Ariz., hears reports of harmful effect of Colorado River diversion (May 1, p. 719)

Bids on first stage of Garrison Dam far below Corps of Engineers estimates (Sept. 11, p. 353)

Western state engineers attack "social theories" in reclamation bureau policies. (Sept. 25, p. 427)

United States and Canada plan to combat erosion on Great Lakes (Nov. 27, p. 719)

Inter-agency committee urges enlargement of Pick-Sloan plan for Missouri Basin project (Dec. 11, p. 788)

Secretary Krug seeks $1.4 billion reclamation funds to bolster Marshall Plan food reserve (Dec. 18, p. 846)

Reclamation Bureau will recommend no new Colorado River jobs until basin states agree on water use (Dec. 25, p. 851)

BUILDINGS

Announce plans for United Nations headquarters in center of New York City (May 29, p. 867)

Building Officials Conference rushes work on national basic building code (Oct. 2, p. 439)

Army to start building of 32 hospitals for Veterans Administration by June (Jan. 30, p. 161)

Federal-aid hospital plan gets under way as surgeon general issues construction regulations (Feb. 20, p. 253)

Department of Commerce announces $1,500,000 research plan to aid building industry (March 27, p. 473)

Army plans $40,000,000 medical center in Maryland (June 26, p. 987)

National Bureau of Standards sets up building technology division (Sept. 4, p. 304)

Producers Council expects building materials supply to be adequate in 1948 with the possible exception of steel and steel products (Dec. 4, p. 779)

BLS reports 61,000 construction employers are now participating in apprentice training programs (Dec. 25, p. 853)

MISCELLANY

Seabees celebrate fifth anniversary, become permanent part of Navy construction forces (Jan. 2, p. 8)

Civil Aeronautics Administration announces details of $70,000,000 1947 federal aid airport program to cover smaller airports (Jan. 16, p. 83)

Alaska Railway work to cost $34,000,000 (Sept. 11, p. 351)

New airport standards set by Civil Aeronautics Administration for federal-aid projects (Nov. 20, p. 697)

FOREIGN EVENTS

JANUARY TO JUNE

India considers three large hydro-electric projects (p. 4)

Russia is building great steel plant in Georgian Republic (p. 5)

France to buy $38 million of reconstruction equipment (p. 78)

British announce plans for 3,000-ft. span suspension bridge over Severn River (p. 79)

John I. Savage assists in planning big dam in Australia (p. 164)

A 2,000-ft. welded steel bridge completed in New South Wales (p. 239)

Finland and France announce extensive programs to increase power production (p. 474)

Saudi Arabia begins work on vast construction projects, financed both by the government and private interests—looking to the development of the country's oil resources. (p. 544)

About 115 miles of irrigation canals completed in Mexico for the Lower San Juan Irrigation District—14,000,000 cu. yd. of excavation were required (p. 545)

Ceylon begins $217 million irrigation program (p. 706)

Rome builds a new subway near the Coloseum (p. 707)

London Town Planning Committee releases plan to revamp the "city" (p. 906)

JULY TO DECEMBER

Hydro power in Southern France (p. 82)

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Construction of Genissiat Dam on Rhone River (p. 222)

India's huge highway program (p. 288)

Tunnels to relieve Tyneside congestion (p. 289)

Extensive highway program planned for Philippines (p. 354)

Italy rebuilds highways and railroads (p. 424)

Roessens Dam in Switzerland nears completion (p. 475)

Housing program for Ruhr under way (p. 490)

5-year plan to rebuild Moscow (p. 558)

Albert Canal in Belgium cleared for traffic (p. 622)

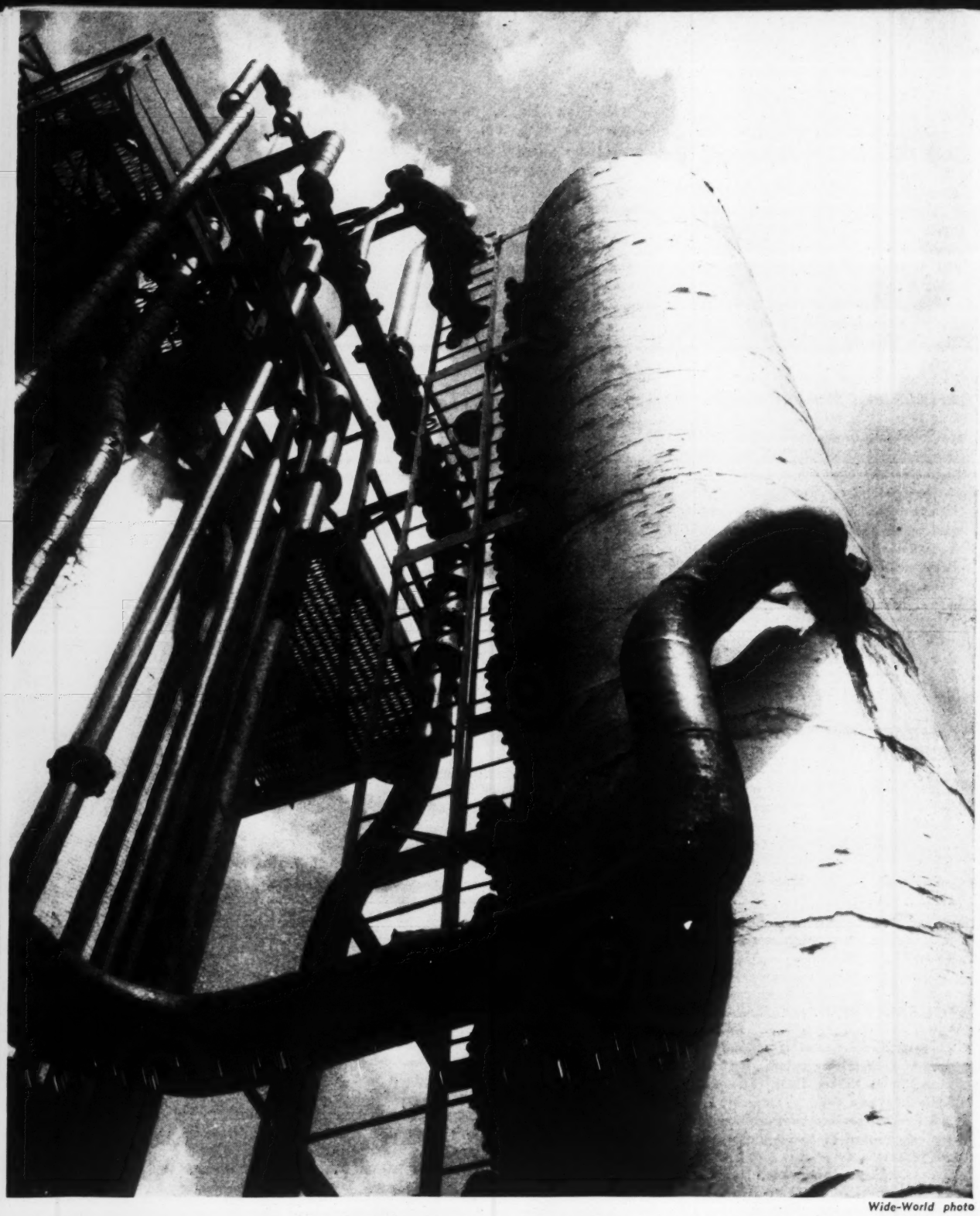
Rio de Janeiro to remove 67-acre hill (p. 700)

The $2,651,000 Hospital Roosevelt nears completion in Guatemala (p. 700)

India invites U. S. contractors to bid on hydro project (p. 768)

Building boom in Ankara, Turkey (p. 769)

A 7-span concrete and steel bridge being erected by British engineers near Baghdad will be the first railway structure to cross the Tigris River (p. 836)



Wide-World photo

Overworked refineries, and everything else associated with the production and distribution of oil, are now in the spotlight of national concern. With oil-plant construction programs being pushed at home and abroad, questions arise as to how we will meet this year's demand for this form of fuel as well as other types of energy.

SURVEY AND FORECAST

1947-1948

IN 1947 we spent too much for too little construction. By money-measure it was a $12 billion year, biggest in peacetime history. But for that outpouring of dollars we got less physical volume than in nine of the last twenty years, and only 60 percent of the peak years, 1928 and 1942. Stated in another way, we spent $12 billion dollars for about the same amount of construction that cost us only $7 billion in 1939.

These are the facts by which 1947 will be longest remembered. Not very satisfying as an epitaph, they may, nevertheless, have their value as a warning and a challenge. Costs must be reduced, volume must be increased. The one is necessary for a stable economy, the other to assure a physical plant commensurate with the nation's needs.

In the following pages the record of 1947 is spread out in detail, the better to appreciate both its progress and its problems. Beyond such appreciation, and based squarely upon it, rest the opportunities of the year just beginning.

TO JUDGE these opportunities a brief perspective of progress during 1947 will be helpful. For, despite constant concern with costs, which on a statistical basis of materials prices and wage rates rose nearly 17 percent during the year to a level that is about 75 percent above 1939, there were many regions of activity in which progress was recorded. Even the indicated rise in construction costs did little more than keep pace with the cost of living; and it may well be that the actual cost of construction to the contractor lagged behind the statistical rise due to greater efficiency from improved materials deliveries and some increase in worker productivity.

As in 1946, housing occupied the spotlight. Indeed, except for the record year of 1925, there were more housing units started and completed in 1947 than in any other year. The total, of about 850,000, was achieved as a result of a phenomenal spurt in the last half of the year, significantly after governmental controls were removed.

Other than in housing, private construction exhibited no notable changes from the relatively high level it achieved in the previous year, the only significant one being a drop of 22 percent in industrial building. Evidently postwar plant expansion programs are tapering off without new ones being started.

In contrast to private work, public construction increased about 23 percent, led by such categories as waterworks, sewage treatment, bridges and public buildings. The bulk of the public work increase was state and local, federal government contracts rising less than 10 percent.

The important aspect to note is that public construction is accounting for slightly more of total construction. It was 28 percent in 1946 and nearly 30 percent in 1947. Significant developments inaugurated in 1947 will tend to accentuate this trend. These include federal aid for airports, the hospital programs of the Veterans Administration and the U.S. Public Health Service and the extensive construction plans of the Atomic Energy Commission.

Real progress was made in reducing man-days lost from strikes. Statistics are not available for the construction industry alone, but for all industry the loss was 35 million man-days, one third of the figure reached in 1946. Nevertheless, it was the third largest loss on record, which is not good, but it was only 0.4 percent of the available working time, which does not look so bad.

THE YEAR'S most important development labor-wise, however, was the passage of the Taft-Hartley Act, which gave employers some of the legal rights that the Wagner Act had conferred upon labor unions. At the same time the new legislation outlawed as unfair such labor practices as jurisdictional strikes, secondary boycotts and featherbed-

ding, particular headaches of the construction industry.

As these developments were unfolding on the domestic front, American construction efforts were also noticeable farther afield, not only in such likely places as Alaska, Hawaii, Guam, Okinawa, the Philippines and Newfoundland, but in Arabia, Liberia, Greece and South America. In 1947 American construction enterprise began to sense some of the global opportunities and responsibilities that are destined to form an important part of its future activities.

BASED on such a background of accomplishment and trends it is reasonable to expect that construction in 1948 will follow much the same pattern as in 1947. Costs can, and probably will, rise another 10 percent, serving as a brake on any possible boom. Nevertheless, construction needs are pressing enough to push total volume to $13.5 billion, a 12½ percent increase. Housing built up to a rate of over 90,000 units a month toward the end of 1947, suggesting the possibility of a 1,000,000 unit year in 1948. Public works, under developed momentum, with some superheated political pressure added on the federal segment because of the Presidential election, are also sure to increase. A continuing high level of national income will brook no interruption in large-scale commercial building.

Materials Supply Improved

THE TROUBLES likely to arise in 1948 will center on materials supply, particularly if foreign-aid exports take enough production to require allocation or rationing. There is some room for optimism in the fact that most construction materials reached production peaks in 1947, making current overall supply better than at any time since the war. Yet there are holes in this armor, caused by continued high demand. Sufficient steel, whether in the form of shapes, bars, nails or accessories, was not provided in 1947, and is not in sight for 1948. Cement stocks are dangerously low despite record production, but manufacturing capacity is probably great enough to meet demand with mill-to-job shipments. Lumber, the third basic material, met the test of demand so well in 1947, that prices are beginning to ease, and grade-marked lumber is again coming on the market. Plywood and hardwood, however, are still short and extra costly.

During the year the spot scarcities permitted the growth of some gray to black markets, but they were usually local and not large in comparison to total sales. Far more important, cost-wise, were uneconomical extra handling, distant hauling and other make-shifts that were necessary to keep materials on a job and worker lay-offs at a minimum.

Equipment Production Increased

CONSTRUCTION EQUIPMENT, like materials, was in better supply in 1947 than in the previous year. In some lines, production caught up with demand, and sales in these classifications are back on a competitive basis. Pumps, compressors, generator sets and concrete mixers in popular sizes are available for immediate delivery, as also are small power excavators of ⅜ and ½-yd. capacity. For larger shovels and cranes, in the ¾ to 2½-yd. range, deliveries take two to eight months or longer. Nearly all construction machines except track-type tractors and power graders are expected to be on a current inventory basis by the end of 1948.

Total domestic sales of construction equipment amounted to about $700,000,000 in 1947, and the dollar volume for 1948 is expected to equal or exceed this figure. Prices average about 35 percent higher than 1941, according to the best estimates of distributors and manufacturers, and additional small increases are a probability for the near future.

Exports are estimated to have taken 10 to 15 percent of construction equipment production during 1947. The foreign market should receive about the same proportion this year including that to be shipped to Europe under the Marshall Plan.

Improved construction machines began to appear in the field during 1947, after being delayed in production by shortages of all kinds and by pressing demand for older models. Additional new models will reach the market this year. High construction costs have accelerated the development of labor-saving equipment, marked by introduction of mechanized small tools as well as by increases in the power and speed of large units. Higher engine speeds and power ratings are one evidence of this trend.

Worker Productivity Better

IN THE REALM of labor, worker productivity definitely did not deteriorate in 1947, and many feel that it substantially improved, largely as a result of better material supply. Strikes and work stoppages decreased, and under Taft-Hartley law pressure this trend should continue. Union lead-

Highlighting the need for a huge program of educational building construction are the many converted barracks pressed into service at many universities. This one in Washington, D. C. is used by Georgetown's school of foreign service.

ers are apt to contest the applicability of the law to construction on the ground that only intrastate commerce is involved, but is is doubtful if they will flout it with possibly-illegal strikes. Also, worker attitude toward the law is far more favorable than that of the union officials.

Construction's current work force is about 1,900,000, with an additional 250,000 workers expected to be needed this year. Biggest deterrent to increasing the force is reluctance of the unions to admit new workers. However, about 110,000 apprentices are being added under union-contractor training programs.

Wages throughout the country in construction went up 15 percent in 1947, and in many cases will be increased again this spring as other industries get raises of perhaps 10 percent.

Construction to Remain Costly

WAGE INCREASES in 1947, high prices for materials and equipment and liberal contingency items in contractors' bids put construction costs at the highest level in history. There is little chance that they will recede in 1948, and a reasonable prospect that they will increase, but much less steeply. Only a drop-off in demand could cause a softening of prices, and this is not in the cards. A buyers' strike in protest against high prices could develop in 1948 as it did in the spring of 1947. Then, however, it succeeded only in temporarily postponing some work, which went ahead in a few months at even higher cost. Such buyers' strikes, nevertheless, do prevent runaway prices. The cost picture in detail is given in a special section in this issue.

Housing Led the Field

ANY REVIEW of construction accomplishment must start with housing, which marked up the best record since 1925. Undoubtedly the greatest stimulus to house building came from continued congressional authorizations under the National Housing Act that made it easy for veterans to borrow money for home purchase and for builders to obtain funds for constructing houses for veterans. With the tremendous demand for shelter backed by ready cash, there was sufficient incentive for home builders to get going. House construction zoomed to near-boom proportions, each month exceeding the previous one in units started. A maximum of 93,000 was reached in October. As a result, about 850,000 new houses were started in 1947, and nearly the same number were completed.

It is significant that although the housing year of 1947 began with most of the forms of postwar federal control still functioning, these restrictions were gradually withdrawn. By April most wartime priorities for distribution of basic materials were abolished. Premium payments for production of critical materials, the ceiling on non-residential construction and nearly all other federal controls

Public housing registered its greatest progress in New York City. Amsterdam Houses, one of eight projects under way, will provide 1,084 apartments built at a construction cost of $1,914 a room and a total development cost of $2,785 a room. It will rent for about $7.50 per room per month. The New York City Housing Authority is achieving considerable success in giving each project an individual architectural character both in building facades and in plot layout.

were eliminated in June by a rent-control bill that also withdrew authorization for more guaranteed-market contracts for factory-built dwellings. By that time, 20 of these contracts, covering the production of 90,000 prefabricated units, had been signed. Aid to prefabricators was continued, however, through a new clause in the National Housing Act, known as Sect. 609, insuring up to 90 percent working capital loans for the manufacture of prefabs.

Incidentally, the hoped-for solution to the housing problem through prefabrication did not materialize in 1947. Only 70,000 new permanent prefabs were sold in 1946 and 1947 together, according to the Prefabricated Home Manufacturers' Institute. In addition, most of these sold for $7,000 or more, exclusive of land. Reasons advanced for high prices and low output are that the industry is not yet in production and that the huge demand for any sort of shelter offers little incentive for price reduction. Before the war, there were only about 20 prefabricators; at the end of 1946, the National Housing Agency listed 275; at present, only 80 are reported in operation. The last have a production capacity estimated at 120,000 houses per year.

New Federal Housing Setup

RECOGNIZING the need for closer coordination of federal agencies concerned with non-farm housing, the President, in July, created the Housing and Home Finance Agency. This step consolidated the activities of the Home Owners' Loan Corp., Federal Savings and Loan Insurance Corp., Federal Housing Administration, Federal Public Housing Authority, Defense Homes Corp. and Federal Home Loan Bank Board. Three new units—the Home Loan Bank Board, Federal Housing Administration and Public Housing Administration—and a coordinating National Housing Commission were formed to carry out the work of the HHFA. The Office of the Housing Expediter expires Feb. 29, 1948.

Whether these moves actually simplify the federal-housing-aid set up or merely represent unproductive reshuffling of agencies remains to be proved. In the meantime, the demand for houses is far from satisfied. A joint congressional committee estimates that 1,500,000 houses a year are needed for the next 10 or 12 years. This is corroborated by a report of the Twentieth Century Fund, putting the

15-year requirement at almost 20,000,000. To satisfy the demand, therefore, the housebuilding industry in 1948 will have to increase its monthly production over even the high 1947 rates.

Housing Costs Too Much

WITH CONSTRUCTION COSTS continuing to rise, however, there is grave danger that the industry may price itself out of the market. Houses sold readily in 1947. Nevertheless, an incipient buyers' strike in the spring showed that people were not happy with the high prices even though they were paid later in the year. Senate and House committees were appointed to investigate and recommend cost-corrective legislation. Various other interested groups made intensive studies.

All blamed high prices of homes on inefficiency. Building organizations were charged with being too small to operate efficiently. Manufacturers were accused of maintaining unnecessarily expensive distribution systems and of attempting to control the markets. Labor was said to engage in restrictive practices and to be producing at an abnormally low rate. And lawmakers were held responsible for unintelligible and archaic requirements that prevented use of new materials and increased the cost of construction. The answer of the building industry, overlooking the fact that only a small percentage of the population could afford to buy new homes at 1947 prices, was merely that prices of houses had not increased relatively as much as other commodities. Congress showed little disposition to be satisfied with the situation, and continued to investigate.

The high purchase prices of homes relative to the average income in the United States points up the need for more rental housing. Under government encouragement, savings banks and insurance companies built some large-scale rental projects, continuing a new trend in institutional investment. Private operators erected a few apartment units, but many of these were practically in the luxury class. Some tenant-owned, multi-story apartment dwellings were also built. Only in New York City did subsidized rental housing show any considerable results.

Congress acted to aid subsidized projects handicapped by rising prices by amending the housing act of 1937. Federal aid for low-rent housing is now permitted where construction costs exceed previous limitations, providing the local housing agency pays the difference between the cost limitations and actual construction costs. At year end Congress was still considering the bill sponsored by Senators Taft, Ellender and Wagner, to establish a permanent federal housing organization to provide continuing subsidies for low-rent public housing and extend aid to local groups for redevelopment of blighted areas through loans and annual contributions. To pass, the T-E-W bill will have to overcome strong opposition from real-estate, home-builder and veterans' lobbies.

Aids to Lower Housing Costs

A SOLUTION to the housing problem is also being sought through the development of new building materials and construction methods. To aid in this work, the Office of Technical Services, Department of Commerce, awarded 12 contracts in 1947, as part of a $1,500,000 program to aid small business. These provided funds for furtherance of modular coordination, improvement of structural clay products, studies of floor construction, standardization of lathing and plastering and advancement of new materials to a practical stage. The National Bureau of Standards, to unify its attacks on building problems, created a new division of building technology, which will perform research in structural engineering, fire protection, heating, ventilating, air conditioning, exterior and interior coverings, codes and specifications. And the technical staff of the Housing and Home Finance Agency continued studies toward improvement of house construction.

As a result of these programs—all of which are aimed at lowering costs—some changes in construction methods are already in evidence, as for example, lightweight spandrels, two or three inches thick, with excellent durability, water-proofing and insulating qualities, to replace masonry walls of considerably greater weight and thickness. Time studies of house construction being made at the University of Illinois may also prove significant when the results are made public. And in the near future, new types of concrete may come into greater use as a result of research on expanded minerals and fibrous materials as aggregates and on waste substances with plastic binders.

Building Code Activity

AT PRESENT, however, restrictive building codes in most localities are an obstacle to the utilization of new developments. Recognizing this, many cities —San Francisco, Chicago and Cleveland, to men-

Symbolic of a new and expanding field for engineers and construction men are the atomic energy towns of Richland, Wash. (shown here), Los Alamos, N. M., and Oak Ridge, Tenn. Industrial facilities and widely-spread research laboratories were also begun in 1947 as a part of the five year, billion dollar program of the Atomic Energy Commission.

tion a few—endeavored to overhaul their codes. Few changes were made in 1947, however, mainly because of legislative difficulties and inability to agree on code provisions in the absence of a standard of comparison.

The inability of these jurisdictions to make revisions, even with favorable public sentiment for this step, is an indication of the urgent need for codes that can be kept up to date without legislative action. It is a good omen, therefore, that in almost all the cities considering revision, the new codes are of the performance-standards type, rather than of the specifications type that has been commonly used heretofore.

On the other hand, the lack of a standard of comparison appears to be more difficult to remedy. A few states have regulations that serve as minimum requirements for some types of construction, but in general there is either inadequate or excessive control over building construction in most parts of the country. Some progress in bridging this gap may be reported. At the Bureau of Standards, a new plumbing code, based on recent research, is being developed. In November, a revised commercial standard for prefabricated homes, designed to improve quality, was promulgated by the Department of Commerce. And the Building Officials Conference of America rushed revisions on its proposed national model code, following announcement in September that a board of consultants had completed its review of it and submitted recommendations.

Vast Hospital Programs Start

NON-RESIDENTIAL CONSTRUCTION in 1947 lagged behind 1946, partly because of governmental regulations that gave housing a priority. Nevertheless, many large industrial concerns managed to continue their expansion programs, to the extent that over $862 million was spent on new plants. Many companies were able to start their postwar research programs in new laboratories completed in 1947, and the facility-building program of the Atomic Energy Commission also helped swell the industrial construction volume.

It was in another field, however, that of hospitals, that the most significant change in the non-residential building picture occurred. Both the $1.2 billion construction program of the Veterans Administration and the almost equally big civilian hospital program of the U. S. Public Health Service made good progress.

VA's program now calls for construction of over 90 new hospitals to provide more than 51,000 beds, plus additions to many existing structures and a reconversion program of some scope. Because of high prices, award of contracts for the VA projects, part of which are being built by the Corps of Engineers, were delayed in 1947, and major redesigns were necessary on a number of jobs to get the project within the funds available. At the start of 1948 construction contracts totalling $110,000,000 were in force for 16 additional projects. It is expected that in the fiscal year, beginning July 1, 1948, some $412,000,000 will be spent on VA construction operations.

Work necessary to get state-wide plans for hospitals and health centers approved both by the states and the Surgeon General's office delayed the PHS program, so that it was not until Nov. 5 that the first construction application was approved. During the next few months, however, some 90 more applications calling for use of $13,000,000 in U. S. funds and $40,000,000 in local matching money secured approval. It is expected that by July 1 this number will be swelled to 400 projects calling for $75,000,000 of federal-aid. This schedule

should permit the award of many construction contracts during 1948 and even more in 1949.

More Buildings For the Colleges

ANOTHER NEW FIELD of building growth appeared in educational institutions. Faced with rapidly increasing enrollment, which is expected to total over 2,500,000 students by the fall term of 1949, American colleges and universities are now engaged in a $1 billion construction program, according to a survey by the U. S. Office of Education. As a temporary measure, during the past three years the Bureau of Community Facilities of the Federal Works Agency made available to these institutions several thousand surplus war structures to provide some 15,000,000 sq. ft. of temporary floor space. This work, which was financed with $83,000,000 provided under the Lanham Act, aided appreciably, but the schools between now and 1950 are expected to need 184,000,000 sq. ft. of additional space estimated to cost $2.6 billion. Projects to cost about $1 billion are now underway, and financing and planning are being completed for much additional work. Programs actually in the construction stage will provide nearly 44,000,000 sq. ft. of non-housing space, and above 36,000,000 of residential space. Ability of the schools to finance the overall program appears good, the Office of Education reports.

Fire-Safety a Live Issue

FIRE LOSSES totaling 10,000 lives and nearly $700,000,000 of property destruction during 1947 reinforced the demand among municipal councils for adequate fire protection in buildings occupied and used by human beings. Almost inescapably, the job is being done piecemeal as usual. Protection of floor openings in hotels is the first step taken or contemplated by most municipalities, as a direct result of the large loss of life in hotel fires in 1946. Chicago's experience, where the hotels first opposed but now have accepted an ordinance requiring inclosure of stairwells and elevator shafts, is typical of the reaction encountered in other cities.

Interest in sprinklers has increased noticeably. A number of municipalities require sprinklers in buildings exceeding certain heights and floor areas; other cities and towns are expected to enact similar ordinances. One city (Syracuse) is debating a requirement for sprinklers in the basements of all mercantile buildings. Two new flush-type sprinkler heads, which drop down to operate in case of fire, do away with the objection to exposed ceiling fixtures.

Unequaled and unprecedented, a great hospital building program is underway with both private and public funds. Shown here is the privately-endowed Sloan-Kettering Institute of the Memorial Cancer Center in New York which was completed last year.

In planning new buildings, designers and owners now generally recognize the need for floor opening protection. Not much change has been noted in attitude toward other requirements for fire-safe construction: non-combustible interior finish and decorations, adequate exit facilities, and automatic detection and extinguishing devices.

The 1943 Building Code of the National Board of Fire Underwriters is in process of revision, and it is hoped the new edition will be ready sometime after the middle of the year.

Roadbuilding Forges Ahead

ROADBUILDING in 1947 made encouraging progress toward meeting the challenge of increasing highway traffic. New construction amounted to $928,000,000, according to reports from state highway departments tabulated elsewhere in this issue, and when maintenance expenditures and equipment purchases are included, the total for 1947 rises to $1,341,000,000 as compared to $960,000,000 in 1946. While this figure is less than half the amount that should be spent annually in the opinion of the American Road Builders Association if highway

building and replacement is to keep pace with needs, it is close to the amount visualized by the sponsors of the postwar federal-aid highway program. By the end of this year, the state highway departments hope to have the total up to one and one half billion. This encouraging gain has been made despite a continuing shortage of engineers, rising costs and slow delivery of some necessary materials.

Among the notable gains is that in building express highways through urban areas, one of the most difficult and costly parts of the postwar highway program. Much of this progress is due to the availability of federal aid for this type of work.

Another advance of last year was recorded in the final approval of the routes to be included in the National System of Interstate Highways. Except for a very few places, the system is made up of about 40,000 miles of existing roads to which preferential treatment has been assigned in the matter of modernization or reconstruction in order to provide adequate interconnection between all major centers of population.

Urban Strangulation

DESPITE the progress being made toward providing adequate facilities for the movement of traffic between cities, many of these metropolitan centers are slowly dying from strangulation due to motor-vehicle traffic within their borders. Remedies for relief of the pressure—parking restrictions, one-way movement of vehicles and other control measures—have proved inadequate. Elevated or depressed streets and off-street parking garages offer some local relief, but are so costly as to be prohibitive in many instances.

Meantime, commercial and industrial enterprises, which make cities what they are, show more than academic interest in moving away from urban centers. Of all the forces tending toward decentralization, none is showing itself to be more potent than traffic congestion.

Bridge Building On Upswing

BRIDGE BUILDING in 1947 emerged from its postwar doldrums, with indications pointing toward an accelerated tempo during 1948. Some $196,000,000 of bridge construction was placed under contract, despite some bid rejections because of high costs. The total represents a 50-percent increase over the 1946 program. And of particular significance is the fact that the closing months of 1947 saw the awarding of several large superstructure contracts, long delayed on account of the shortage of steel; these included the Mississippi River bridge at Memphis, Tenn., and five large bridges to carry relocated Pennsylvania Railroad tracks around the Conemaugh reservoir in western Pennsylvania. This development is welcome if it foreshadows increasing rolling of structural steel, because availability has not kept pace with demand.

Most of the bridge activity was concentrated in small structures although larger bridge projects were not as scarce as formerly. One of the latter is the five-lane $6,500,000 highway bridge over the Mississippi River at St. Louis, located just above the Eads bridge, while another is the $27,000,000 toll structure over the Mystic River near Boston, Mass., to relieve a serious bottleneck in that city. In addition, Connecticut awarded contracts last year for a twelve-span, $3,200,000 toll bridge over the Connecticut River between Old Saybrook and Old Lyme.

In New York, work was completed on remodeling the Bronx-Whitestone suspension bridge to increase its aerodynamic stability and widen its roadway. Trusses 14 ft. deep were superimposed on the 11 ft. stiffening girders. A direct result of the failure of the Tacoma Narrows bridge in 1940, this deepening of the stiffening members of the New York bridge is also being followed in the new design for Tacoma which may reach the construction stage this year. A low bid of $11,200,000 has been received, and award of the contract is pending, awaiting the sale of bonds to cover cost of construction. This will be the first major suspension bridge undertaken since 1940, and its construction will, therefore, be an event of more than normal importance, particularly since the design has benefited in several ways from new knowledge gained meantime with respect to aerodynamic stability.

With the growth of freeways and their extension into and through cities, grade separation structures are destined to become not only major bridges but complicated ones. Previews of this situation were furnished in 1947 by the start of construction on a four-level structure at the intersection of Arroyo Seco-Harbor and Hollywood freeways near downtown Los Angeles, and on a three-level interchange structure near Norfolk, Virginia.

All these developments and trends, basic and important as they are, do not quite, however, mark 1947 as a notable year in bridge history. This missing element, perhaps, may have been supplied

by the announcement late in November that the California Toll Bridge Authority had approved two new crossings of San Francisco Bay, one a high-level bridge parallel to the existing one and the other a causeway and tube. Here are projects of real magnitude, the aggregate cost being in the neighborhood of $240 million. Both are claimed to be necessary, although the immediate reason for their joint approval is to settle a controversy over which was better. With San Francisco showing the way, it may be that other great metropolitan centers may be encouraged to think and act boldly with respect to some of their needed bridge improvements.

Europe Rebuilds Its Bridges

LARGE AND PRESSING though our bridge needs are, they compare with Europe's as a paper clip with a plate girder. Yet, despite shortages of labor, materials, equipment and money, European engineers have made some inroads against the mountains of "must" projects that faced them at the end of the war. During 1947 notable progress was made in replacing many makeshift structures with more permanent types. In a few cases innovations in design were recorded.

The most significant development was probably the extensive use in France of prestressed concrete girder bridges—some 20 structures of this type having been started, with as many more on the drawing boards. The most important single prestressed concrete bridge was that at Luzancy over the Marne whose span of 181 ft. sets a new record. Piano-wire reinforcing was used. Another bold bridge in France was under construction over the Rhone at Vienne. A 354-ft. barrel arch, its central 207 ft. section has a rise of less then 1 in 12. Dead load stresses were induced in this unusual construction by hydraulic jacks inserted in the crown.

Most spectacular area of bridge building activity in Europe in 1947 was the Rhine River valley. Here in the 425 miles between the Swiss and the Dutch boarders the 44 prewar bridges had been reduced to wreckage, and replaced during and after the war with a few light and narrow military spans. In 1947 a program of replacement of these temporary structures was begun, and 24 bridges were scheduled for attention; of these a dozen were put under construction and several were completed.

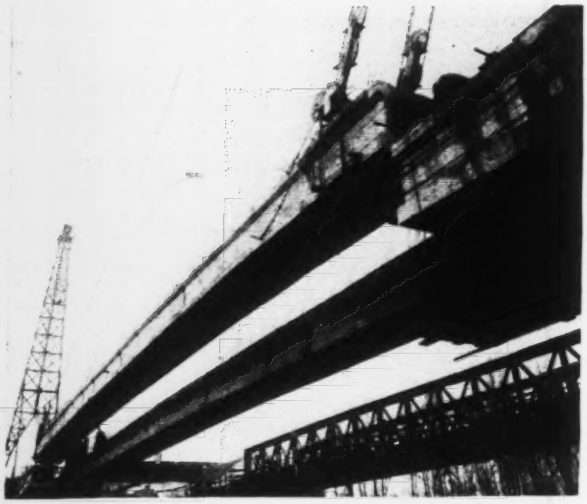
For the most part the Rhine bridging program is notable for erection ingenuity and adaptation of available materials, but in the Cologne-Deutz

Freeways are the order of the day wherever traffic volume can justify the cost. In 1947, they were built in such widely separated locations as California, New York, Michigan, Maine and Pennsylvania. The one pictured here is the North Sacramento Freeway in California.

bridge the Germans introduced a design involving some new ideas. Replacing the famous self-anchored suspension bridge is a deck cantilever girder with a 605-ft. center span and 302-ft. side spans. Of cellular steel design the girders are 13 ft. wide and vary in depth from 10 to 25 ft. throughout their length. To reduce the positive bending moments in the center span the side spans are counterweighted with a particularly heavy roadway pavement. Another bridge of this type is scheduled for Bonn.

Elsewhere in Europe, 1947 marked the permanent reconstruction of other well-known bridges. In Budapest, Hungary a new Danube crossing, begun before the war and known as the Arpad bridge, was brought near completion. A series of continuous steel girders, of which the longest span is 340 ft., the bridge will have a deck area second in size only to the Storstrommen bridge in Denmark. The deck is 90 ft. wide and 3,000 ft. long and is carried on the Vierendeel cross-frames that provide the bridge with unusual lateral rigidity.

In Italy the 100 ft. high, 900 ft. long stone rail-



Longest prestressed concrete span (181 ft.) was built across Marne River at Luzancy, France. With lines from tall towers on either bank, 120 ft. center section of one of the prestressed girders is being lowered to position.

way viaduct of Desenzano between Venice and Milan was rebuilt as a series of 51-ft. span concrete rigid frames resting on the stubs of the old stone piers. And in Holland the 4,600-ft. highway and railway bridges over the Rhine at Moerdijk were rebuilt in their original 10- and 14-span layouts.

Praiseworthy as these achievements are however, they represent only a small beginning on Europe's bridge-building task. Structures requiring reconstruction or replacement are still numbered in the thousands. So in 1948, and for many years thereafter, bridge-building in Europe will be a major occupation—and a fertile field for design and construction ingenuity.

Construction Abroad

THE POSTWAR TREND of American interest in the construction needs of battle-damaged and economically undeveloped areas abroad continued strong in 1947. It was expressed both in active participation and in studied technical interest. And it was accentuated by two developments in U. S. foreign policy—the so-called Truman Doctrine as applied to Greece and Turkey, and the Marshall Plan as applied to all countries of Europe that wish to share in its benefits.

Of particular significance in the realm of active foreign participation has been the formation of several engineering and development organizations by private capital, with others of like nature reportedly being planned. Set up with world-wide operations in view, but with a special focus on economically undeveloped areas, the organizations, two of which are identified with such well-known names as Stettinius and Rockefeller, are currently directing their attention to Latin America, Argentina, Liberia and the Philippines.

In contrast to such manifestations of U. S. private enterprise activity in foreign development are the federal government's plans for aid to Europe, and eventually to China. So far, only in Greece are American engineers and contractors actually in the field, and it may well be that this may mark the limit of active participation in European reconstruction. For the remainder of the countries there is the Marshall Plan of subsidized self-help or loans under which the U. S. will furnish industrial equipment and materials to those that agree to maximum levels of exertion in their own behalf.

During 1947 only the spade work for the Marshall Plan was gotten under way. But both here and in the sixteen western European countries (Russia and the eastern countries having rejected the plan and set themselves actively to oppose it) events were moving at the year end toward its implementation by early next summer. How it will be administered and to what extent U. S. technical personnel will be involved are still uncertain.

In the meantime much reconstruction work and some new development have been undertaken by individual countries, Holland, Belgium, France and Italy being notable examples, and Germany and Austria sorry exceptions. Outside Europe, projects and plans have multiplied greatly over a year ago so that throughout the world it may be said that 1947 marked the dawn of hopes for an era of development through construction of new facilities for a general raising of living standards. A special article elsewhere in this issue surveys the principal projects that give this prospect some substance.

Airport Expansion

LITTLE PROGRESS was made during the year on the billion dollar program for airport improvement and expansion that was authorized by Congress in May, 1946, to be completed in seven years. About half the money was to be put up by the federal government, this federal aid being restricted to not over $100,000,000 in any one fiscal year. Early last year the Civil Aeronautics Authority asked Congress for $70,000,000 for federal aid in the fiscal year 1948, chiefly for work on larger airports. But when Congress came to act on the request it found that most of the $45,000,000 appropriated

for the year 1947 was still unallocated, so it cut the request about in half. As last year drew to a close, only a little over $13,000,000 of this money had been allocated, and that was spread quite thinly over 130 airports, mostly small ones. Apparently the sharp rise in construction cost has caused most cities and towns to review their airport plans.

Meanwhile, engineers continued their studies looking toward better designs to meet ever-increasing airplane loads. At Patterson Field in Ohio, runways and taxiways to support 300,000 lb. on two wheels were built to designs developed through careful studies. Concrete slabs 21 in. thick were laid on the runway and 25 in. thick on the taxiways. And at the big new Baltimore airport, tests on subgrade compaction were begun using a "super-compactor," a roller that can have its gross weight increased from 40 to 200 tons, the load being carried on four 30 x 33-in. pneumatic tires.

In airport operations, the most significant development of the year was the transfer of control of the airports of the New York metropolitan region to the Port of New York Authority. This will permit unification of the operations of the airports, thus materially increasing their efficiency and overall capacity. Also, the plan should simplify the financing of improvements.

Water Service and Inflation

UNDER PRESSURE of inflated and still-rising costs, water utilities look with some desperation on the need for obtaining more revenue to maintain service and undertake expansion of facilities. Based on a study of both public and private waterworks operations throughout the nation, Louis R. Howson, consulting engineer of Chicago, reaches the conclusion that an overall 30 percent increase of rates is in order. Justification, in part, for such an increase rests on the fact that about one quarter of waterworks revenue is spent for new construction. Just how much construction costs have risen may be seen from a statistical adjustment of the value of last year's contracts to prewar levels. Totalling over $139,000,000, this figure represents only $80,000,000 of work on the basis of 1939 dollars, an indication that present costs are 74 percent higher than those of the prewar period.

Of considerable concern to water works engineers is the continued high consumption of water. Both domestic and industrial demands are at levels as great or greater than the war period during which record consumption figures were reached in many places. Continuance of this condition points to the possibility that many cities must advance their programs of water-supply enlargement, and most of them may be forced to adopt water-conservation measures. Already, on the west coast, municipalities are alarmed by deficiency of rainfall at a time when reservoirs should be filling.

Among the major projects being planned, none is more spectacular in size than the 950 mgd. filtration plant for Chicago. This will be three times as big as the world's largest, which distinction now attaches to the recently completed Chicago South District plant. Another Great Lakes city, Cleveland, has started a $35,000,000 supply and treatment program, and Baltimore has begun development of the Upper Patapsco River source. Denver has approved a $23,000,000 bond issue for waterworks expansion, while San Diego and San Francisco are engaged on major improvements.

Among the year's treatment developments is the installation at Mounds, Ill., of a diatomaceous earth filter plant, this being the first application of a wartime development for municipal use. Important advances in water-quality testing are presaged by the introduction of the electron microscope in bacteria identification. One of these instruments, costing $8,000, is now in use at the Chicago South District filtration plant where research is being conducted on immediate coliform identification. Orthodox identification methods, which have changed little in half a century, require so much time for obtaining results that their principal value is an historical check on purification-plant performance rather than on a prompt index of operation conditions.

Sewage Disposal Happenings

ALTHOUGH sewage-works construction contracts totalled almost $175,000,000 last year—45 percent above 1946, and a record achievement as measured by dollars—the physical volume of work on the basis of pre-war prices is more nearly represented by a figure of $101,000,000. Statistically, this investment comparies unfavorably with the $160 million in contracts let during the record year of 1939. Thus, it may be concluded that a great number of municipalities are deferring construction of urgently needed disposal facilities. However, several large projects are underway. Philadelphia entered the first stage of a comprehensive treatment program when contracts were let for the Northeast disposal plant; the Sanitary District of Chicago

approved a $22,000,000 interceptor, Los Angeles began construction of a 245-mgd. high-rate, activated-sludge project; and work is soon to start on a large sedimentation and sludge-digestion plant for San Francisco.

Attention has been directed to the feasibility of sewage effluents for industrial processing water, and it is urged that this development be given more consideration. In nine cases it was reported that effluent utilization not only provided process water at minimum cost, but also made it possible for several municipalities to benefit with substantial financial returns.

Interest in the problem of sewage disposal on trains has been stimulated by a research program sponsored by the Association of American Railroads. One installation, now being tested, included maceration to "colloidize" solids into liquid form, heat disinfection and track-side dispersal. Use of supersonic sound for bacterial destruction is being studied in connection with this problem.

An unusual proposal—construction of four huge interceptors in river beds—was submitted by the Allegheny County (Pa.) Sanitary Authority to the U. S. Army Engineers for approval. The object is to minimize costs by avoiding construction through streets in thickly populated areas.

Federal Aid for Stream Pollution

AMONG THOSE who confidently expect passage of a federal stream-pollution control bill is President Truman. At least this must be the presumption, because in his budget message last month he said: "The expenditure estimates include $1.4 million for surveys under the stream-pollution abatement program now under consideration by the Congress." Thus, for the first time in connection with pending pollution-control legislation, a specific request has been made for money to implement it.

Despite this evidence from high authority of substantial progress toward federal control of pollution—which, incidentally, is the culmination of more than 50 years of effort in this direction—many state governments and industrial interests have not lessened their resistance to the move. Historically, state agencies have administered pollution-control measures in the areas under their jurisdiction, and they look with jaundiced eye on any possible federal usurpation of their functions. They have shown only grudging interest in the most-favored bill at present, S-418, which was passed by the Senate last July and is before the House for consideration. Not only does the bill contain clauses aimed to reassure states of their continued sovereignty in these matters, but it attempts to make it worthwhile for them to get on the bandwagon. To wit: authorizes $5 million yearly for distribution among the states to conduct investigations; $12 million annually for advances to local governments to aid in planning projects; and $100 million per year for loans to local agencies for the construction of remedial works. Nevertheless, bureaucratic direction of state activities still remains, which may explain why enthusiasm for passage of the legislation seems to be centered largely in Washington, D. C.

Local Progress in Stream Pollution

AS IF to strengthen denial of the need for federal participation in stream-pollution abatement, the year was marked by continued vigorous action on the part of states, municipalities and industries, particularly in the midwest and eastern areas. Indicative of this was: West Virginia's program for water-quality classification of its streams; drafting of a compact for the New England Interstate Water Pollution Control Commission, approval for which has already been voted by Rhode Island, Massachusetts and Connecticut; and establishment of Maryland's Water Pollution Commission with similar developments in this direction under way in Ohio and in New York.

Of special interest because it typifies a growing acceptance by industry of its responsibility in curtailing pollution is the action approved by most of the industrial companies in the Potomac River basin. Top management officials have agreed that they will not permit the installation of additional processing installations at their individual plants until they are satisfied these units will not increase pollution of water receiving the wastes. Another index that industrial-management is becoming conscious of the necessity for providing proper waste disposal facilities rests on the knowledge that designers of plants now include on their staffs specialists who can integrate such facilities with new layouts. Meantime, an increasing number of industrial groups such as the Manufacturing Chemists' Association, are promoting among themselves the philosophy that waste-abatement measures deserve prompt attention.

Finally, as a further token of the development of a realistic attitude toward stream-pollution control, there is the court decree handed down by a

The thicker runways predicted for the planes of the future have reached the construction stage. This one at Patterson Field in Ohio is a concrete slab 21-in. thick, 300-ft. wide and 10,000-ft. long. The aprons and taxiways are 25-in. thick.

Supreme Court justice in Maine last December. Believed to be unique in the annals of pollution litigation, the decree specifies that certain paper mills on the Androscoggin River would be permitted to discharge a specified amount of waste based on maintaining a predetermined quality of water in the stream. Industry looks upon this as establishing the principle that since a stream possesses natural purification resources, these should be put to most effective use before artificial treatment methods are required.

New Tasks for Sanitary Engineers

DURING THE WAR, both on the home and battle fronts, sanitary engineers made significant contributions in the control of environmental conditions for the prevention of disease outbreaks. Safeguards to public health in the form of engineered water supplies, sewage disposal and drainage, for example, were a primary defense against certain disease epidemics.

Foreshadowing new tasks for the sanitary engineer are the implications of bacterial warfare as well as the problems associated with atomic energy development. Noting that the Atomic Energy Commission has appointed to its staff a highly qualified sanitary engineer, it is to be presumed that he will be concerned, among other things, with such problems as the disposal of radioactive wastes. While there is no public information on the type or quantity of such wastes resulting from atomic-energy production, it is generally understood that unless care is exercised in their disposal, such wastes could seriously contaminate streams. Certainly, in an atomic-bomb attack, there is a hazard to water supplies. What steps, if any, should be taken in water-purification techniques to cope with either peace or wartime radioactivity contamination would seem to be a likely field of exploration for the sanitary engineering profession.

One might also speculate on the role of the sanitary engineer in devising and operating defensive measures in the event of so-called bacterial warfare. Among disease agents of possible use (which include those affecting man, animals and farm crops) those related to food, water and airborne transmission would be of special concern to public health workers. But there has been no delineation yet—at least publicly—of the kind or scope of probable protective measures. It is not unlikely, however, that conventional tests for detecting water pollution would call for re-examination to provide more positive means for detection of pathogenic organisms during periods of possible attack. And

Missouri River Cutoff being dug across Liberty Bend just east of Kansas City will shorten river 4 miles and reduce flood profile by about 1 ft. A high level bridge, now under construction to cross the cutoff with two 460-ft. spans, will be completed before the river is turned into its new channel.

since the means adopted for transmission of some diseases could be far different from those that operate under natural conditions, entirely new techniques for sanitary control might be called into application.

Refuse Disposal Practice

TO DETERMINE to what extent certain practices in refuse disposal might be favored, *Engineering News-Record* made a sampling survey of 300 cities from coast to coast, and these are some of the conclusions: predominant methods for disposal are hog feeding (32 percent) and the use of dumps (31 percent). Although incineration is employed in only 18 percent of the cities surveyed, it is significant that the number of new installations planned almost equals the number already in use. Sanitary fills were operated in 18 percent of the reporting cities, this figure reflecting practice that has been adopted only within the last few years.

In large measure (73 percent), municipalities still rely on general tax funds for financing refuse disposal service. Special service charges are employed in 16 percent of the communities surveyed, and the balance of 11 percent includes cities in which services are arranged and paid for by householders who individually contract for them.

A decision that legal experts said might have far-reaching effects on city financing methods was rendered late in the year by the Florida State Supreme Court. This body declared valid a "rent-purchase" contract by which the city of Jacksonville proposes to obtain two new incinerator units without issuing bonds or certificates of indebtedness. The city proposed to enter into a contract with an incinerator company which would erect the two units, and the city then rent the equipment at an annual rate of $31,074. At the end of 15 years, the units would become city property, or the city would have the right to purchase them outright, at any time, for a fixed price of $381,000, less any amount paid as rentals.

Sanitary Fill Hazards

VIRTUES of the landfill method of refuse disposal, which were slow to be recognized until the Army adopted the practice and wartime restrictions forced communities to seek a cheap and effective means of handling increased volumes of refuse, have promoted its wide use throughout the nation. Not all fills are being operated effectively, however, and in many cases operations are conducted without full knowledge of limitations to the practice and the potentiality of hazard from gas fires and explosions. Thus it was that in New York City an emergency housing project was located on a fill relatively young in age; excavations for utilities in the fill resulted in the release of nauseating odors and, in addition, the houses themselves had to be safeguarded from possible permeation by combustible gases. Elsewhere in the nation there were reports of explosions in sewers and culverts and of fires related to gas formation and spontaneous combustion in fill areas. These hazards are not unknown to those who are skilled in the operation of sanitary fills, and precautionary practices have been developed. What is needed now is a wider observance of the sound engineering principles on which sanitary-fill refuse disposal is based.

Public Works Blueprints

WITH BLUEPRINTS for some two billion dollars of state and local public works projects "on the shelf," the Federal Works Agency program for advanced planning aid came to a close last June. It will be recalled that the FWA was authorized by the War Mobilization and Reconversion Act of 1944 to

stimulate the planning of local public works, these to be ready for construction as economic conditions might dictate. Municipalities normally do not have money for planning purposes until bonds for specific projects are voted by the local taxpayers. Federal funds were offered, therefore, on the basis that these advance-planning loans were to be repaid when projects went into construction.

Some $62 million was made available for these loans, and FWA reports that advances were made or scheduled for 7,235 projects. FWA also reports that at the end of this year 483 repayments had been made aggregating $2.75 million. If municipal construction programs had not been curtailed by high costs, the repayment figures on advances undoubtedly would have been higher.

The need for new local public works, however, is not denied (FWA estimates a $75 billion backlog of demand that should be satisfied "over the next few years,") so that a return to federal-aid for advance planning would no doubt be welcomed. The Truman budget message last month takes this into account with a recommendation to that effect.

Missouri Basin Tops River Control

RIVER WORK during 1947 was confined largely to the construction of dams, levees and walls for the control of floods. The dollar volume of flood-control work initiated or resumed following the war is very large, the appropriations to meet expenditures by the Corps of Engineers during the current fiscal year being about $300,000,000. Although the projects are scattered over 35 states, the majority of them are on tributaries of the Mississippi River. And as if to demonstrate the need for this work, the spring flood in that river at St. Louis was the highest in 103 years, while on some tributaries new records were set.

Chief among river projects is development of the resources of the Missouri River basin, to which $175,000,000 has been allotted to first-priority projects of the Pick-Sloan plan, authorized in the Flood Control Act of 1944 at a cost then estimated to be between $1,250,000,000 and $1,500,000,000 at 1940 prices—probably $2,000,000,000 today.

During 1947 the Army Engineers and the Bureau of Reclamation swung into major construction schedules on nine reservoirs on the Missouri system, a score of local flood protection works, an agricultural levee system, and the 9-ft. river navigation channel, now authorized for the 760 miles from Sioux City, Iowa, to the mouth.

Bank stabilization on the lower Mississippi attains spectacular dimensions as mass production and laying methods for revetment are perfected. This caving bank is now safe under a carpet of articulated concrete matting.

Outstanding among these projects on the Missouri are Garrison Dam above Bismark, N.D., and Fort Randall Dam at the South Dakota-Nebraska line, which will cost $177,000,000 and $152,000,000 respectively. Both are large earth-fill structures designed primarily for the storage of flood waters, but with some power, navigation and irrigation benefits.

Including about $3,000,000 for soil conservation projects of the Department of Agriculture, the three responsible federal agencies received some $120,000,000 for Missouri Basin work in the current fiscal year. Appropriations recommended to the present session of Congress would give these agencies about $165,000,000 for the basin program in the 1949 fiscal year beginning July 1. Congress has authorized $700,000,000 to date for Missouri basin development by the Army Engineers and the Bureau of Reclamation.

Sea Level Canal Proposed at Panama

IN DECEMBER President Truman sent to Congress the report of a special board of consultants that has

Scheduled for an ultimate capacity of 300,000 kw., the new steam turbo-electric generating plant of the Dayton Power and Light Co. is typical of the installations that in 1947 added four times as much power to the nation's capacity as did hydro.

been studying the Panama Canal since early in 1946. In brief, the board reported that from the commercial viewpoint alone, the canal could be made adequate for shipping until the year 2000 by the expenditure of $130,000,000 to complete the third set of locks, but that if safety from a military viewpoint is also desired, the canal should be cut down to sea level, at a cost of $2,483,000,000. Congress has not yet acted on the report.

St. Lawrence Seaway Revived

As the year closed the St. Lawrence ship canal and power project again began to appear in the headlines as a result of approval of that project by the Senate Committee on Foreign Affairs following a long series of hearings. Approval was on the basis of making the ship canal self-liquidating by requiring the payment of tolls, which would be a radical departure from the traditional policy of free waterways.

What the committee actually approved was a joint resolution of the two houses of Congress, which in turn approves the unratified 1941 agreement between this country and Canada for construction of a ship canal in the international section of the river and development of power. The agreement had some major defects and now is out of date in the matter of costs. Revised figures put the cost of work yet to be done at over $700,000,000.

Reclamation Charts Its Future

Instructed by Bureau of Reclamation top-management to proceed "on a full-steam ahead" basis following Congressional approval of a $195,000,000 budget—biggest in its history—the regional branches of the bureau did just that. And as a result of this momentum, less than six-months later the bureau was seeking a supplemental appropriation of some $39 million dollars (Congress finally okayed $37 million), with Commissioner Michael W. Straus saying: "There is no economy in dragging out jobs on which work has started." While admitting the validity of Mr. Straus' argument, not a few observers pointed to a danger: all the bureau need do is turn over a spadeful of earth to start a project, after which it could be called "unjustifiable waste" to stop work until the project was completed.

That the bureau anticipates moving quite a few spadefuls of earth in the years ahead is evidenced by the planning that is now going on. Last October, Secretary of the Interior, J. A. Krug, told the National Reclamation Association of a seven-year two billion dollar program that would in effect double the irrigated lands of 14 western states. Just what such a long-range plan means can best be appreciated by recalling that in the entire 45-year history of the bureau, there has been spent to date only about one-billion dollars.

Recent data from the bureau reveals that, as of June 1947, water users have repaid some $140 million, while the net revenues from power (latest available record, June 1946) amount to about $79 million. While the sum of these two represents only a fraction of the billion-dollar advance, over the last half-century, the bureau reports contracts with water users for eventual repayment of some $450 million and states that "the total investment to be reimbursed . . . through power revenues . . . will be $1,032 million".

Repayment contracts, of course, are one of the most complex of the bureau's problems, and the rising cost on projects initiated before the war adds to the current complexity. The Colorado-Big Thompson project, estimated at $44 million in 1938, will now cost about $128 millions. The bureau seeks

an amendatory repayment contract with the water users reflecting this three-fold increase of cost, but little progress has been thus far made.

Undoubtedly the Congress, through its appropriation committees, will have quite a bit to say about this situation when the time comes for the next advance of money for the project. And Congress will also be faced with the problem of expediting a decision among the Colorado River Basin states regarding their respective rights to the available flow. Until such a decision is reached, the Bureau of Reclamation has stated that it will not recommend construction of any further projects in the basin. Highly controversial, it is believed that nothing short of a Supreme Court ruling on the matter can determine the allocation of the waters of the Colorado River.

Big Reclamation Jobs Moved Ahead

THIS HAS BEEN a record year of activity for the Bureau of Reclamation is attested not only by the amount of money it is spending, but also by the variety and scope of projects underway.

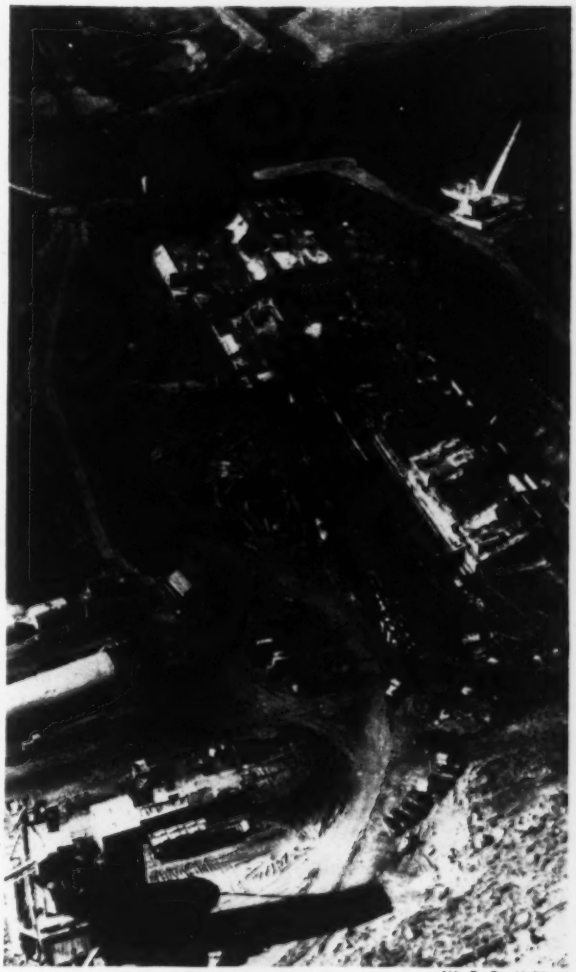
In addition to the Colorado-Big Thompson job, the vast trans-mountain diversion scheme for bringing west slope water into northern Colorado, steady progress was made on the California Central Valley project. Estimated to cost $416,000,000, about half this amount has been expended, with major activity now centered on canal and pumping-plant construction.

On the Columbia Basin project, expected to total $610,000,000, more than one-quarter of this amount has been spent. Three dams and two canals were under construction last year, these to form part of the distribution facilities for the water stored behind Grand Coulee dam.

Davis Dam, located between Hoover and Parker dams and the fourth structure for regulation of the Colorado River, was retarded in construction by the necessity to undertake extensive foundation grouting. About 20 percent of the estimated $104,000,000 cost has been expended.

At this time, when the demands for power are constantly increasing, it should be noted that the bureau had 16 hydro plants in operation with a capacity of 2,203,000 kw., while 12 other projects with a capacity of 965,000 kw., were under construction. Congressional authorization has been given for 14 more plants whose total capacity will be 529,000 kw.

Details of bureau operations are given elsewhere in this issue, in the section devoted to an inventory on major projects.



W. F. Graif Photo

Within a great cofferdam, construction of Ft. Gibson Dam on the Grand River in Oklahoma reached this stage by the end of 1947. A combined flood control and power project, its 461,000 cu. yd. of concrete is mixed with ice to assure optimum placing temperature.

More Power Needed

THE PREDICTED POSTWAR SLUMP in the demand for power did not materialize. And because manufacturers of power equipment could not increase production fast enough, private power companies are far behind in their expansion schedules at a time when the per-capita use of electricity in home and factory is inclining sharply upward, bringing peak demands perilously close to capacity.

Some power companies are endeavoring to prepare for double the present power demand in 15 to 18 years. Long-range aspect of power production may be affected materially by studies now under way, witness the progress in research

recently reported in developing liquid fuels and by-product gas from coal. When this new source of power is available, experts assert, there will be sufficient power for hundreds of years. By that time it is to be hoped that we shall also be tapping atomic sources of energy.

Professional Problems

THERE was no lack of work for engineers in 1947. As a result, rates of compensation in private work rose, making it difficult for public agencies to get and hold men. For example, late in the year it was estimated that the state highway departments were short about 10,000 of the number of men needed to handle the engineering work called for by the current highway-building program.

As was to be expected, the surplus of jobs for engineers caused a marked decrease in interest in the subject of collective bargaining for engineering employees. Another reason for a decline in interest in bargaining groups is the fact that the status of professional employees was greatly improved and clarified by provisions of the Taft-Hartley Act. That act defined professional men, and provides that they cannot be compelled to join collective-bargaining groups including other than professional men unless they vote for such inclusion.

As the year closed, organizations of professional engineering employees on the Pacific Coast were voting on affiliation with the National Professional Association of Engineers, Architects and Scientists, an association that was set up in the latter part of 1946 as the nucleus of a national organization of professional men concerned with collective bargaining. Favorable action appeared probable.

The fact that the cost of operating technical and professional societies has gone up along with most other costs was brought home to many engineers during the year by a drastic curtailment of financial support given to local sections of the American Society of Civil Engineers following the failure of the membership to authorize an increase in dues paid to the national society. Finding money to print technical papers is one of the major problems, but engineers also are finding that it takes money for the profession as a group to have a voice in local and national affairs and the recognition that goes with it. The experiences of the past year suggest that while engineers want such recognition they are unwilling to pay for it. Such an attitude was a considerable factor in the defeat of the proposal to increase ASCE dues, and it is even more evident in the lack of support given to the National Society of Professional Engineers. There now are nearly 115,000 registered engineers, and yet only 17,000 are members of the national society.

All 48 states now have registration laws for engineers, Montana having been added during the year. The District of Columbia is the only region without such a law, a situation that should be remedied in 1948 by a bill now in Congress.

New Construction Techniques

IN THE FINAL ANALYSIS, however, 1947 made its most significant contribution not in professional developments, governmental plans nor housing booms, but in a resurgence of the spirit of searching for better, faster, cheaper ways of doing the every-day field jobs. For the most part, this search centered on new and refined applications of mechanical tools. At one end of the scale the lowly wheelbarrow was equipped with a power plant, and at the other a rubber-tired compactor for airplane runway foundation consolidation was built to exert a pressure of 200 tons. In between, two-wheel tractors continued to multiply, and a four-wheel tractor entered the bulldozer field hitherto blanketed by crawler type machines.

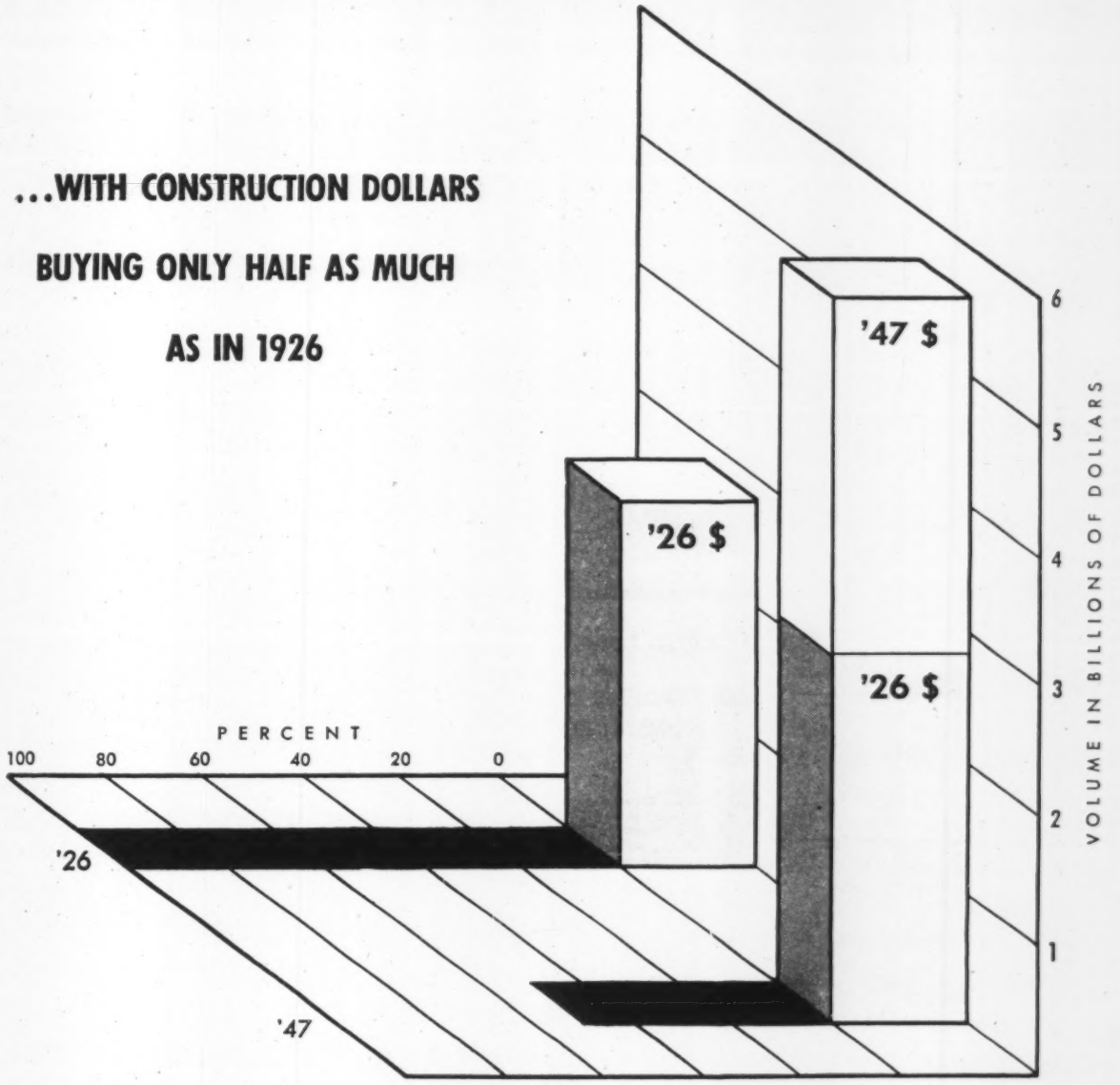
Use of air-entraining cement continued to expand, and several dump-truck bodies of new design were developed to facilitate the hauling and discharge of air-entrained concrete. Hammer mills were used on several projects to produce stone sand for concrete and, in general, aggregate plants grew in size and complexity, several on the large dam jobs producing five sizes of stone to exceptionally close gradation. Ice, too, has become a concrete aggregate, with ice-making machines on dam jobs producing as much as 135 tons daily that is added to the mix in lieu of some of the water.

At least four East Coast projects adopted vertical sand drains to speed consolidation of water-bearing sub-soil under superimposed fill. Also, chemical soil solidification was employed to control an incipient sand boil in a power-plant foundation.

On concrete pipe mains in the Northwest, a new machine showed its capacity for making water-tight joints by shooting grout under pneumatic pressure. A Colorado dam was refaced by forcing grout under water into gravel fill behind a wall of precast slabs previously placed while the reservoir was dry. On a Peruvian hydro project, a Calyx drill is sinking a 6-ft. vertical hole to serve as a penstock 1,400 ft. deep. So long as such ingenuity and forward thinking is applied to the problems at hand construction will continue to make each year a stepping stone to higher achievement.

BUSINESS GUIDEPOSTS...

...WITH CONSTRUCTION DOLLARS BUYING ONLY HALF AS MUCH AS IN 1926



BEGINNING . . . A 14-page review of past and present trends and future outlook

VOLUME · FINANCING · COSTS

1947—Construction Volume vs Costs

The dollar volume of heavy engineering construction, as reported by *Engineering News-Record*, totaled $5,659 millions in 1947, exceeding the 1946 dollar volume by 9 percent. As the result of a 17 percent increase in construction costs during the year, the physical volume of construction, as measured by the *ENR* volume index based on 1913 as 100 declined to 231, or 8 percent below the 1946 volume and was only 1 percent above the physical volume reported for 1926.

ESTIMATED TOTAL CONSTRUCTION

Engineering News-Record's estimated total of all U. S. construction of $12,000 millions for 1947 was the second highest on record, exceeding the 1946 estimate of $10,350 millions by 16 percent. The record high was attained in 1942 when $12,821 millions were estimated for total construction. Private construction reached a new record high of $8,357 millions, rising 13 percent from the previous record high of $7,415 millions in 1946. A larger gain, however, occurred in public construction which rose 24 percent over 1946 to $3,643 millions.

I—ESTIMATED TOTAL CONSTRUCTION

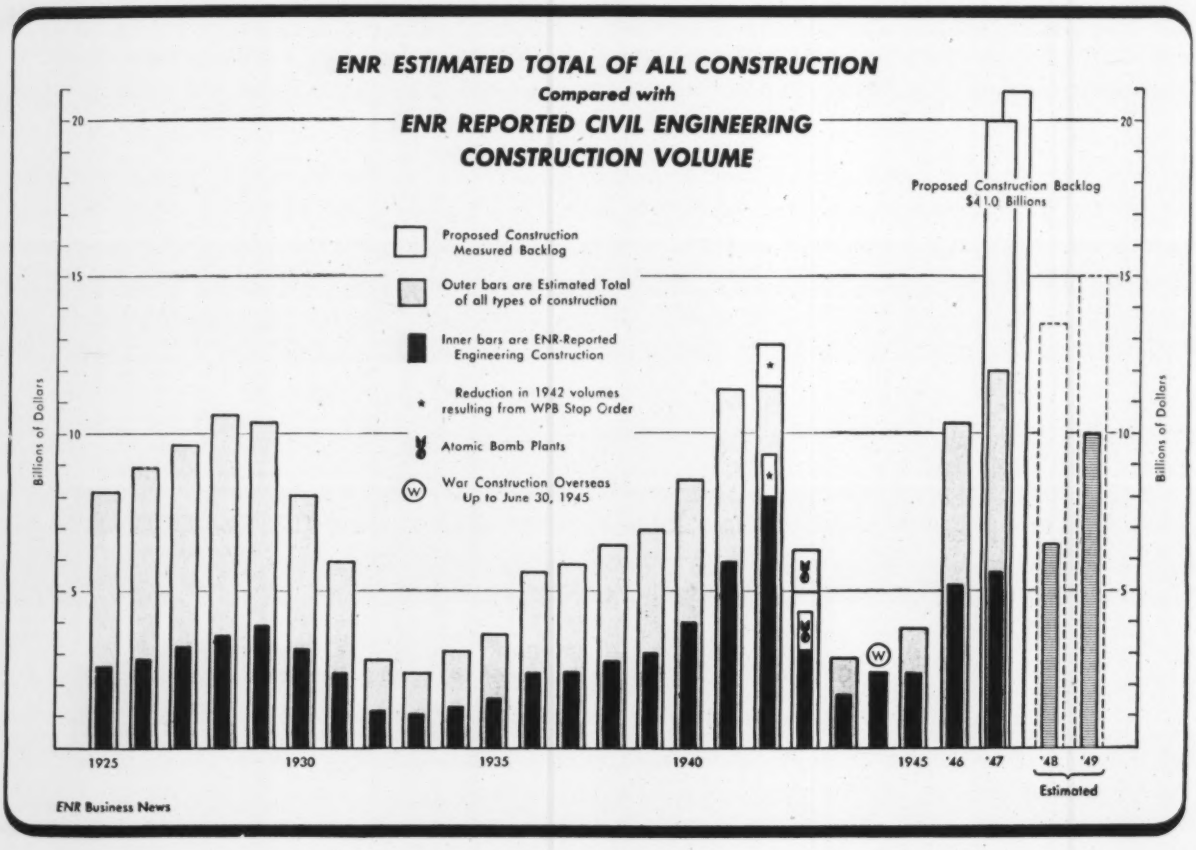
	(Millions of Dollars) Public	Private	Total	ENR Volume Index 1913 = 100
1925	2,476	5,702	8,178	201
1926	2,670	6,208	8,878	228
1927	3,073	6,522	9,595	263
1928	3,480	7,100	10,580	287
1929	3,263	7,114	10,377	317
1930	3,363	4,695	8,058	260
1931	3,098	2,832	5,930	220
1932	1,918	921	2,839	127
1933	1,533	907	2,440	102
1934	2,373	731	3,104	114
1935	2,460	1,221	3,680	134
1936	3,140	2,450	5,590	185
1937	2,806	3,046	5,852	172
1938	3,680	2,800	6,480	197
1939	3,750	3,224	6,974	211
1940	4,550	3,960	8,510	269
1941	7,200	4,196	11,396	375
1942	11,061	1,760	12,821	553
1943	3,820	1,180	5,000	176
1944	1,815	1,085	2,900	96
1945	1,490	2,308	3,798	123
1946	2,935	7,415	10,350	248
1947	3,643	8,357	12,000	231

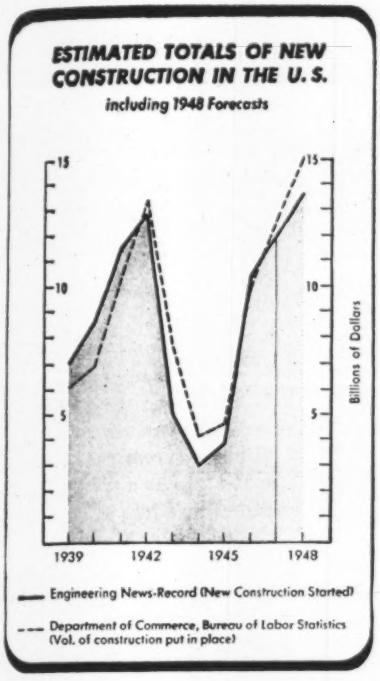
Construction of one and two-family homes is estimated at a record high of $3,698 millions, an increase of 33 percent over the previous record of $2,790 millions in 1946 and accounts for nearly 31 percent of total construction. All other private construction, which includes commercial and industrial building and mass housing, showed a net gain of 0.7 percent over 1946.

State and municipal construction in 1947 is estimated at $2,823 millions, 29 percent greater than in 1946, and is 24 percent of total construction. Federal construction, amounting to $820 millions, showed a more moderate gain of 9 percent over 1946, and accounted for 7 percent of total construction. State and municipal and federal construction combined to bring the public construction volume to 30 percent of total construction in 1947.

FORECASTS FOR 1948

Engineering News-Record estimates the 1948 total of all construction in the United States at $13,500,-





000,000, an increase of 12.5 percent over the 1947 estimate. An additional $6.5 billions is estimated for maintenance in 1948. The estimate of total new construction includes one and two-family houses, and construction projects below the minimums reported by *Engineering News-Record* as well as *ENR* heavy engineering construction. The estimate of engineering construction as recorded by *Engineering News-Record* is placed at $6,365,000,000, a gain of 12.5 percent over the 1947 record peacetime volume of $5,659,232,000.

Total new construction to be put in place in 1948 has been estimated jointly by the Department of Labor and the Department of Commerce at $15.20 billions for the United States. As compared with the 1947 estimate of $12.67 billions, the 1948 figure shows a gain of 20 percent.

BACKLOG OF PROPOSED CONSTRUCTION

The proposed backlog of heavy engineering construction, as recorded by *Engineering News-Record*, from January, 1943 through December, 1947 totaled $40,978,529,000 but measured in 1940-, '43-, '44-, '45-, '46-, and '47-dollars. This measured backlog alone could support over 7 years of construction at the 1947 dollar volume rate.

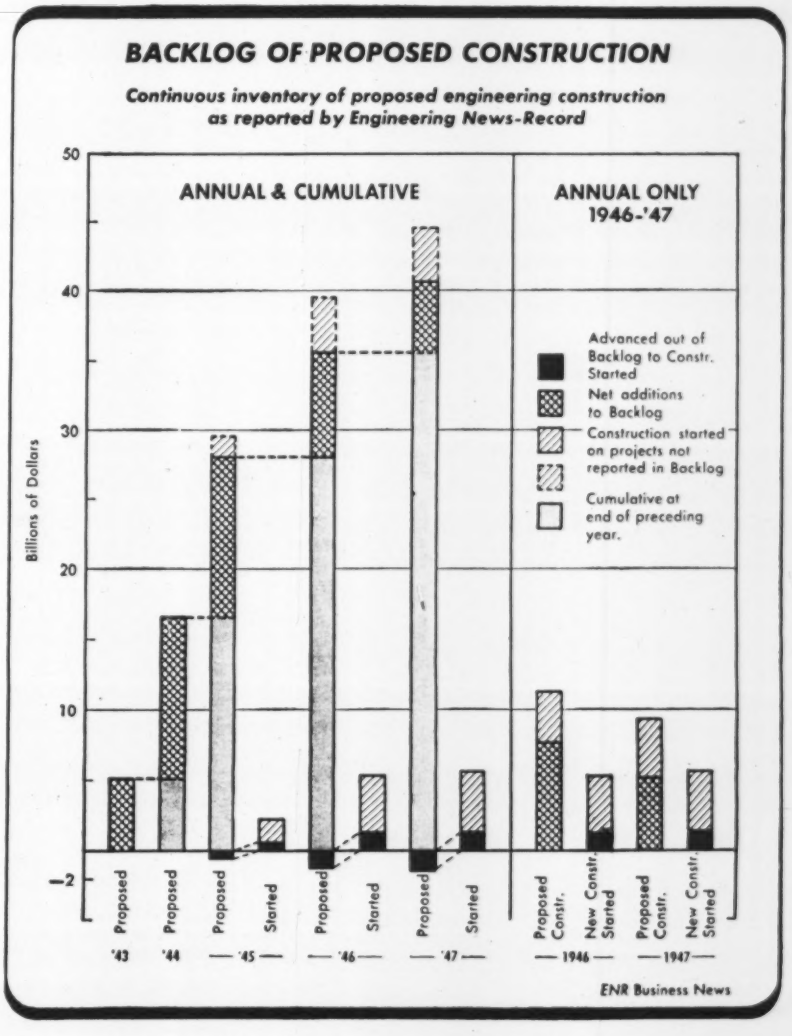
This is a conservative measure of the backlog of needed construction since only $1,764,925,000, or 31 percent, of the total contract awards of $5,659,232,000 during 1947 advanced to active status from the backlog. The remaining 69 percent went under contract direct without having been recorded first as proposed construction.

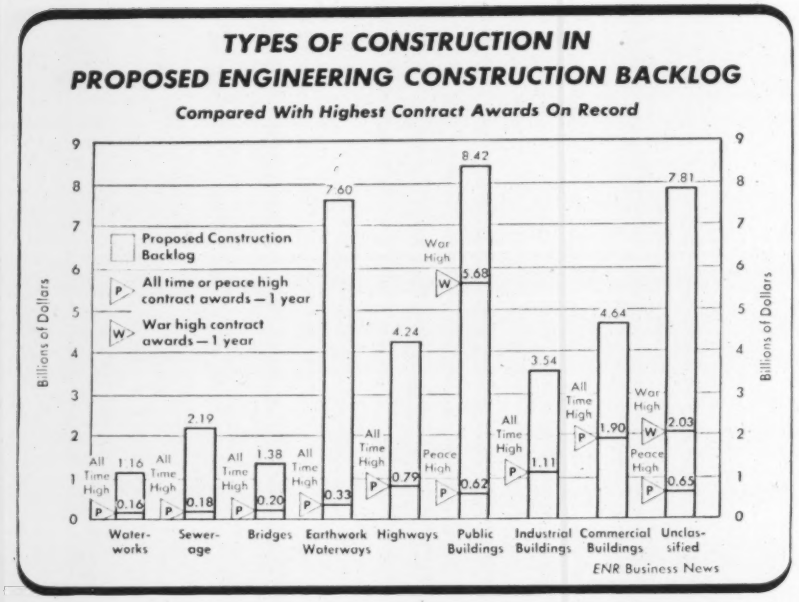
Geographically, West of the Mississippi has the largest volume of advance construction planning, or 26 percent of the total backlog. Middle Atlantic follows, accounting for 25 percent of the total. Far West accounts for 18 percent, Middle West for 16 percent, South for 10 percent and New England for 5 percent.

ENR-REPORTED CONSTRUCTION

The dollar volume of heavy engineering construction, as reported by *Engineering News-Record*, reached a new peacetime record high of $5,659,232,000 exceeding the 1946 record by 9 percent. The 1947 construction volume was exceeded only during the war, in 1941 when a total of $5,869,000,000 was recorded and in the peak war year of 1942 when the dollar volume reached $8,006,000,000.

Public construction in 1947 ran up a total of $2,491,431,000, a gain of 23 percent over 1946. Private construction totaled $3,167,801,000 in 1947, a gain of only 0.3 percent over 1946. Of the public total, state and municipal construction accounted for $1,835,012,000 while federal construction accounted for $656,419,000. As compared with the 1946 totals, the dollar volume of state and municipal contracts rose 29 percent in 1947 and federal contracts, 10 percent.





In the several groups of classified construction, sewerage showed the largest gain over 1946, rising 54 percent to $174,764,000, a new all-time record high, exceeding the previous all-time record of $160,000,000 in 1939. Bridges last year also reached a new all-time high of $196,297,000, rising 53 percent above the 1946 volume and 4 percent above the previous high of $188,000,000 in 1936.

Highway construction and commercial buildings reached new record highs in 1947, exceeding the previous all-time records reported for 1946 by 3 percent. Highway contract volume recorded in 1947 totaled $794,133,000 compared with $769,387,000 in 1946 and commercial building contracts rose to $1,897,961,000 from the 1946 total of $1,846,173,000. Of the total commercial building contracts awarded in 1947, $1,578,153,-

II—BACKLOG OF PROPOSED ENGINEERING CONSTRUCTION

As Reported to Engineering News-Record through December, 1947
(thousands of dollars)

States	Proposed Public Construction: Water-works	Sewer-age	Bridges	Earthwork Irr.-Drain	Streets and Roads	Build-ings	Un-classified	Federal Govern-ment Work	Proposed Private Construction: Bridges	Indus-trial Bldgs.	Commer-cial Bldgs.	Un-classified	Total Proposed Construction: Private	Public	Total	States
Maine	1,303	4,548	1,083	3,178	29,526	32,153	36,850	11,912	.....	3,400	6,205	5,040	14,645	108,641	123,286	Maine
New Hampshire	2,856	4,643	5,808	1,051	12,245	20,609	16,779	10,159	.....	7,476	9,310	9,227	26,013	63,991	90,004	NewHampshire
Vermont	1,883	2,374	100	57,376	1,642	16,910	14,243	59,019	.....	845	3,510	13,754	18,109	94,528	112,637	Vermont
Massachusetts	38,609	67,607	50,874	30,124	84,054	316,601	94,237	175,148	.....	59,229	94,382	14,204	167,815	682,106	849,921	Massachusetts
Rhode Island	7,193	16,223	18,985	773	21,372	41,763	14,995	16,586	.....	8,437	35,267	1,065	44,769	121,304	166,073	Rhode Island
Connecticut	7,821	37,546	14,555	86,728	84,950	172,064	55,109	121,325	195	52,707	144,524	7,086	204,512	458,773	663,285	Connecticut
New England	**59,665**	**132,941**	**91,405**	**179,230**	**233,789**	**600,100**	**232,213**	**394,149**	**195**	**132,094**	**293,198**	**50,376**	**475,863**	**1,529,343**	**2,005,206**	**New England**
New York	182,842	306,728	187,424	107,134	604,762	1,514,282	1,386,394	277,429	.....	228,447	889,792	113,905	1,232,144	4,289,566	5,521,710	New York
New Jersey	66,317	86,535	44,706	26,241	150,754	272,638	116,049	59,731	40	149,180	98,217	82,001	329,438	763,240	1,092,678	New Jersey
Pennsylvania	100,005	208,168	92,762	220,979	282,725	472,969	318,941	323,508	2,155	151,680	304,566	88,425	546,826	1,696,549	2,243,375	Pennsylvania
Maryland	31,640	25,684	20,658	13,997	159,011	257,114	52,384	151,487	.....	38,080	94,819	37,357	170,256	560,488	730,744	Maryland
Dist. of Col.	8,897	11,355	11,524	2,500	36,977	241,999	83,932	238,677	.....	230	28,600	628	29,458	397,184	426,642	Dist. of Col.
Delaware	1,812	10,830	25,970	250	12,887	20,245	5,407	6,360	.....	19,826	10,160	33,957	63,943	77,401	141,344	Delaware
Middle Atlantic	**391,513**	**649,300**	**383,044**	**371,101**	**1,247,116**	**2,779,247**	**1,963,107**	**1,057,192**	**2,195**	**587,443**	**1,426,154**	**356,273**	**2,372,065**	**7,784,428**	**10,156,493**	**Middle Atlantic**
Virginia	4,102	23,685	31,908	121,745	36,920	78,914	22,974	148,792	.....	65,113	12,518	32,169	109,800	320,248	430,048	Virginia
West Virginia	1,380	23,452	1,073	19,500	4,919	35,533	38,918	32,219	.....	8,286	6,870	14,028	29,184	124,775	153,959	West Virginia
North Carolina	20,211	19,840	6,054	202,219	12,691	108,735	32,448	250,803	95	32,859	66,446	25,401	124,801	402,198	526,999	North Carolina
South Carolina	6,557	7,176	3,034	100,686	14,484	57,193	21,926	116,188	.....	34,347	18,725	44,669	97,741	211,056	308,797	South Carolina
Georgia	9,872	9,345	8,760	18,662	17,386	104,481	36,417	51,478	378	54,322	50,954	49,427	155,081	204,923	360,004	Georgia
Florida	31,122	58,418	42,046	77,767	30,109	138,322	54,655	103,436	.....	27,696	104,225	45,534	177,455	432,439	609,894	Florida
Alabama	7,023	15,950	3,207	63,849	7,965	69,627	36,480	85,445	.....	46,117	52,594	33,672	132,383	204,101	336,484	Alabama
Mississippi	3,184	9,737	1,493	39,842	9,117	38,111	16,567	53,986	.....	49,946	16,090	73,944	139,980	118,051	258,031	Mississippi
Louisiana	5,938	23,052	21,847	179,717	9,467	72,120	63,502	221,066	600	55,259	62,419	39,428	157,706	375,643	533,349	Louisiana
Kentucky	8,032	10,435	10,464	188	39,615	36,881	12,479	18,669	.....	13,453	20,146	21,676	54,675	118,094	172,769	Kentucky
Tennessee	5,758	47,243	4,505	70,350	27,447	161,419	28,971	109,815	40	32,332	55,856	41,874	130,102	345,693	475,795	Tennessee
Southern	**103,179**	**248,333**	**134,391**	**894,525**	**210,120**	**901,336**	**365,337**	**1,185,897**	**1,113**	**419,730**	**466,843**	**421,222**	**1,308,908**	**2,857,221**	**4,166,129**	**Southern**
Ohio	58,944	155,444	149,363	47,423	270,234	428,543	132,774	74,407	1,307	285,758	163,138	79,135	529,338	1,242,825	1,772,063	Ohio
Indiana	3,746	65,340	56,952	40,752	68,293	161,387	43,988	68,389	150	198,598	91,566	52,336	342,650	440,458	783,108	Indiana
Illinois	92,044	190,003	93,634	196,710	353,598	440,041	223,108	207,874	12,850	139,265	160,605	47,173	359,893	1,589,138	1,949,031	Illinois
Wisconsin	7,187	26,721	21,583	746	72,186	105,379	32,676	22,533	.....	55,646	37,751	40,084	133,481	266,478	399,959	Wisconsin
Michigan	56,404	148,833	67,078	11,324	136,954	622,747	310,258	62,245	.....	69,882	36,291	101,224	207,397	1,353,598	1,560,995	Michigan
Middle West	**218,325**	**586,341**	**388,610**	**296,955**	**901,265**	**1,758,097**	**742,804**	**435,448**	**14,307**	**749,149**	**489,351**	**319,952**	**1,572,759**	**4,892,397**	**6,465,156**	**Middle West**
Minnesota	11,080	26,835	20,438	3,852	20,616	124,361	38,244	26,289	25	27,939	37,607	50,529	116,100	245,426	361,526	Minnesota
Iowa	6,348	20,106	7,207	24,028	11,246	62,654	16,396	34,141	695	9,782	29,293	57,940	97,710	147,985	245,695	Iowa
Missouri	16,767	43,603	41,911	193,920	314,124	293,084	92,500	292,558	.....	102,371	121,887	128,857	353,115	995,909	1,349,024	Missouri
Arkansas	5,392	16,930	18,310	238,918	23,170	40,504	36,861	245,268	150	28,023	13,216	53,540	94,929	380,085	475,014	Arkansas
North Dakota	5,288	4,468	173	218,250	938	13,426	4,446	222,173	.....	2,352	4,300	21,962	28,614	246,989	275,603	North Dakota
South Dakota	3,072	2,873	80	274,310	1,637	5,005	5,979	272,543	.....	1,045	2,850	15,883	19,778	292,950	312,734	South Dakota
Nebraska	4,880	15,140	5,515	186,529	24,546	52,063	30,278	214,762	.....	16,768	10,332	60,325	87,425	318,951	406,376	Nebraska
Kansas	11,028	10,618	4,204	158,800	9,840	71,411	11,317	187,058	.....	64,284	17,665	179,672	261,621	277,218	538,839	Kansas
Oklahoma	21,357	20,053	9,125	268,603	61,812	115,407	77,807	281,264	489	44,682	57,467	145,982	248,620	574,164	822,784	Oklahoma
Texas	98,624	127,771	54,410	609,360	306,807	495,372	279,294	556,941	1,505	842,594	703,859	734,906	2,282,864	1,971,638	4,254,502	Texas
Montana	3,507	6,096	63,669	305,852	26,436	37,945	13,918	309,691	.....	14,624	4,552	9,595	28,771	457,423	486,194	Montana
Wyoming	878	3,078	522	201,559	2,966	10,272	4,312	204,853	.....	21,365	600	22,553	44,518	223,587	268,105	Wyoming
Colorado	16,664	3,602	290	332,473	14,755	56,513	25,548	364,377	.....	11,398	32,037	40,027	83,462	449,845	533,307	Colorado
New Mexico	2,192	2,507	1,525	48,501	4,116	20,297	37,213	61,000	50	13,895	4,709	57,618	76,272	116,351	192,623	New Mexico
W. of Miss.	**207,077**	**303,680**	**227,379**	**3,064,955**	**823,009**	**1,398,314**	**674,113**	**3,272,918**	**2,914**	**1,201,122**	**1,040,374**	**1,579,389**	**3,823,799**	**6,698,527**	**10,522,326**	**W. of Miss**
Idaho	1,509	5,040	4,102	171,728	45,739	21,563	18,882	180,058	.....	24,016	5,193	8,385	37,594	268,563	306,157	Idaho
Utah	5,834	15,521	1,959	144,981	41,203	32,201	15,191	157,211	.....	13,810	8,706	12,720	35,236	256,890	292,126	Utah
Arizona	7,251	4,085	850	595,867	10,797	13,224	21,381	610,425	.....	3,352	5,631	12,041	21,024	653,455	674,479	Arizona
Nevada	563	3,107	4,500	38,953	41,255	23,643	5,199	21,859	.....	2,240	13,220	5,062	20,522	117,220	137,742	Nevada
Washington	39,769	31,168	47,818	589,287	142,711	185,899	91,949	667,452	1,240	50,942	94,611	15,585	162,378	1,128,601	1,290,979	Washington
Oregon	12,290	23,258	24,577	278,890	86,906	88,184	32,452	323,192	.....	80,556	75,477	17,189	173,222	546,557	719,779	Oregon
California	108,305	183,611	53,483	970,994	451,370	622,114	616,545	1,052,019	873	279,260	725,803	229,599	1,235,535	3,006,422	4,241,957	California
Far West	**175,521**	**265,790**	**137,289**	**2,790,700**	**819,981**	**986,828**	**801,599**	**3,012,216**	**2,113**	**454,176**	**928,641**	**300,581**	**1,685,511**	**5,977,708**	**7,663,219**	**Far West**
United States	**1,155,280**	**2,186,385**	**1,362,118**	**7,597,466**	**4,235,280**	**8,423,922**	**4,779,173**	**9,357,820**	**22,837**	**3,543,714**	**4,644,561**	**3,027,793**	**11,238,905**	**29,739,624**	**40,978,529**	**United States**
Canada	**113,801**	**212,792**	**279,773**	**491,228**	**1,246,026**	**887,134**	**1,014,246**	.....	**775**	**565,422**	**529,245**	**1,060,614**	**2,156,056**	**4,245,000**	**6,401,056**	**Canada**

000, or 83 percent, was for mass housing, a gain of 4 percent over the 1946 volume of $1,518,407,000.

Public buildings totaled $615,492,000 for 1947, a gain of 49 percent over the 1946 volume of $414,087,000 and a new peacetime high. Waterworks contract awards of $139,141,000, the third highest on record, rose 27 percent over 1946. Earthwork, irrigation and drainage contracts of $326,856,000 declined 0.2 percent from the all-time record in 1946 but were still the second highest on record.

Industrial building construction declined to $862,205,000 in 1947, 23 percent below the 1946 record volume of $1,113,251,000. The 1947 dollar volume of industrial building was the second highest on record. Construction of new process industries, which accounted for 34 percent of total industrial building in 1947, declined to $292,544,000 during the year, or 11 percent below the 1946 volume.

Of the 15 industries classified under industrial buildings, 10 in all showed declines for 1947 in the dollar volume of contract awards from the 1946 volumes. These declines ranged from 12 percent for machine and machined parts plants to 61 percent for automobile factories. The 5 industries which showed gains over 1946 are as follows: radio, 59 percent; aircraft factories, 35 percent; public utilities, 34 percent; metal refining and rolling mills, 16 percent; food industries, 3 percent.

Unclassified construction reached a new peacetime high of $652,383,000 in 1947, a gain of 84 percent over the 1946 volume of $354,112,000. Unclassified private construc-

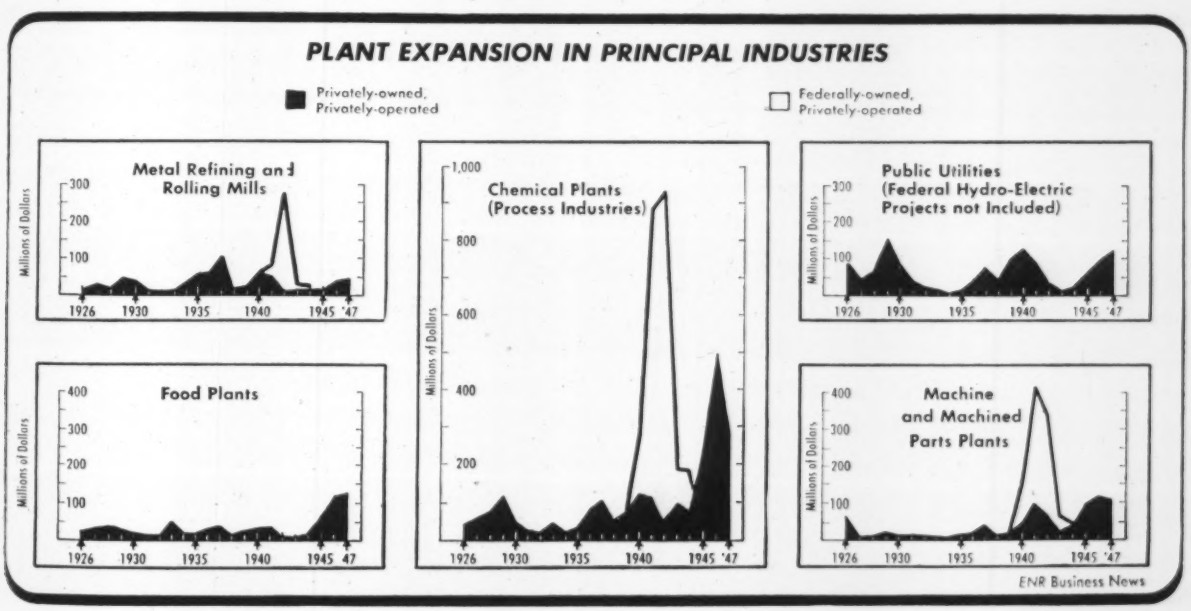
III—CONTRACTS FOR INDUSTRIAL BUILDING CONSTRUCTION BY INDUSTRIES

(Federally-owned privately-operated plants added to private construction 1942-47)

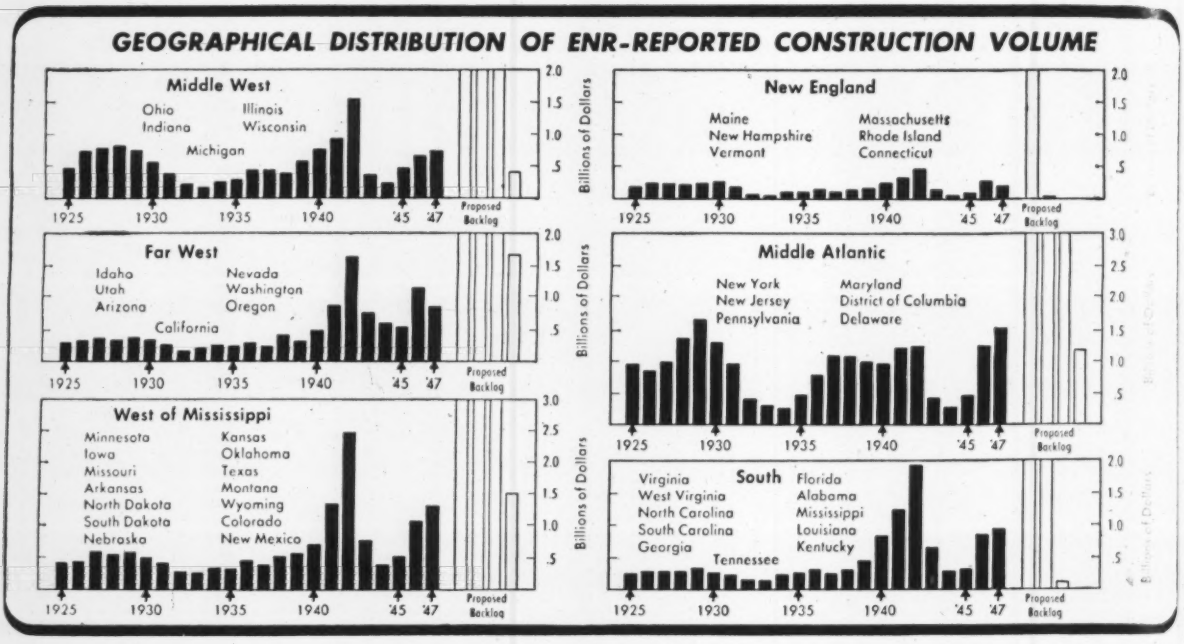
Value in Thousands of Dollars, *ENR* Reports

	1942			1943			1944			1945			1946	1947
	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Pvt. Own.
Transportation Service														
1. Railroads	$2,473		$2,473	$3,180		$3,180	$5,488		$5,488	$10,961		$10,961	$17,198	$12,402
2. Automotive	1,733		1,733	1,029		1,029	2,225		2,225	15,512		15,512	33,544	26,392
Public Utilities	29,225		29,225	6,555	$300	6,855	14,769		14,769	52,150		52,150	93,330	125,307
Process Industries (a)	42,263	$902,206	944,469	104,024	82,201	186,225	75,376	$108,453	183,829	245,129	$61,675	306,804	499,302 (c)	292,544 (c)
Food Industries (b)	9,544	500	10,044	9,134		9,134	11,080	1,226	12,306	64,688		64,688	118,997	124,152
Metal Refining & Rolling	9,217	272,325	281,542	13,875	11,409	25,284	17,439	3,617	21,056	18,218		18,218	36,833	46,215
Metal Working Plants														
1. Auto Factories	530		530	210	200	410	540		540	41,700		41,700	29,300	11,526
2. Aircraft Factories	16,687	314,688	331,375	1,406	20,045	21,451	4,052	8,162	12,214	3,848	2,825	6,673	1,698	2,297
3. Foundries	6,629	22,991	29,620	1,368	3,360	4,728	2,861	2,680	5,541	2,333	1,040	3,373	5,693	2,858
4. Mach. & Mach. Parts	62,338	272,349	334,687	16,631	42,312	58,943	27,820	16,652	44,472	86,970	7,569	94,539	114,671	101,174
Radio	2,300	1,000	3,300	498	40	538	167		167	7,540		7,540	1,045	1,660
Textiles (Excl. rayon)	366		366	320		320	823		823	6,840		6,840	16,325	11,624
Wood Industries	700		700	1,049		1,049	517		517	8,592		8,592	10,391	8,121
Miscellaneous														
1. General Factories	15,729	123	15,852	6,825	255	7,080	9,039	90	9,129	65,742	290	66,032	122,647	92,317
2. Refrigeration & Cold Storage	585		585	730		730	2,118		2,118	4,857		4,857	9,187	4,637
Total	$200,319	$1,786,182	$1,986,501	$166,834	$160,122	$326,956	$174,314	$140,883	$315,197	$635,170	$73,399	$708,569	$1,113,251 (c)	$862,205 (c)

(a) Includes distilleries. (b) Includes breweries and wineries. (c) In addition to these figures, contracts totaling $25,000 were awarded for federally-owned privately-operated plants in 1946 and $15,899 in 1947.


PLANT EXPANSION IN PRINCIPAL INDUSTRIES
Privately-owned, Privately-operated
Federally-owned, Privately-operated
Metal Refining and Rolling Mills
Chemical Plants (Process Industries)
Public Utilities (Federal Hydro-Electric Projects not Included)
Food Plants
Machine and Machined Parts Plants
Millions of Dollars
1926 1930 1935 1940 1945 '47
ENR Business News

GEOGRAPHICAL DISTRIBUTION OF ENR-REPORTED CONSTRUCTION VOLUME



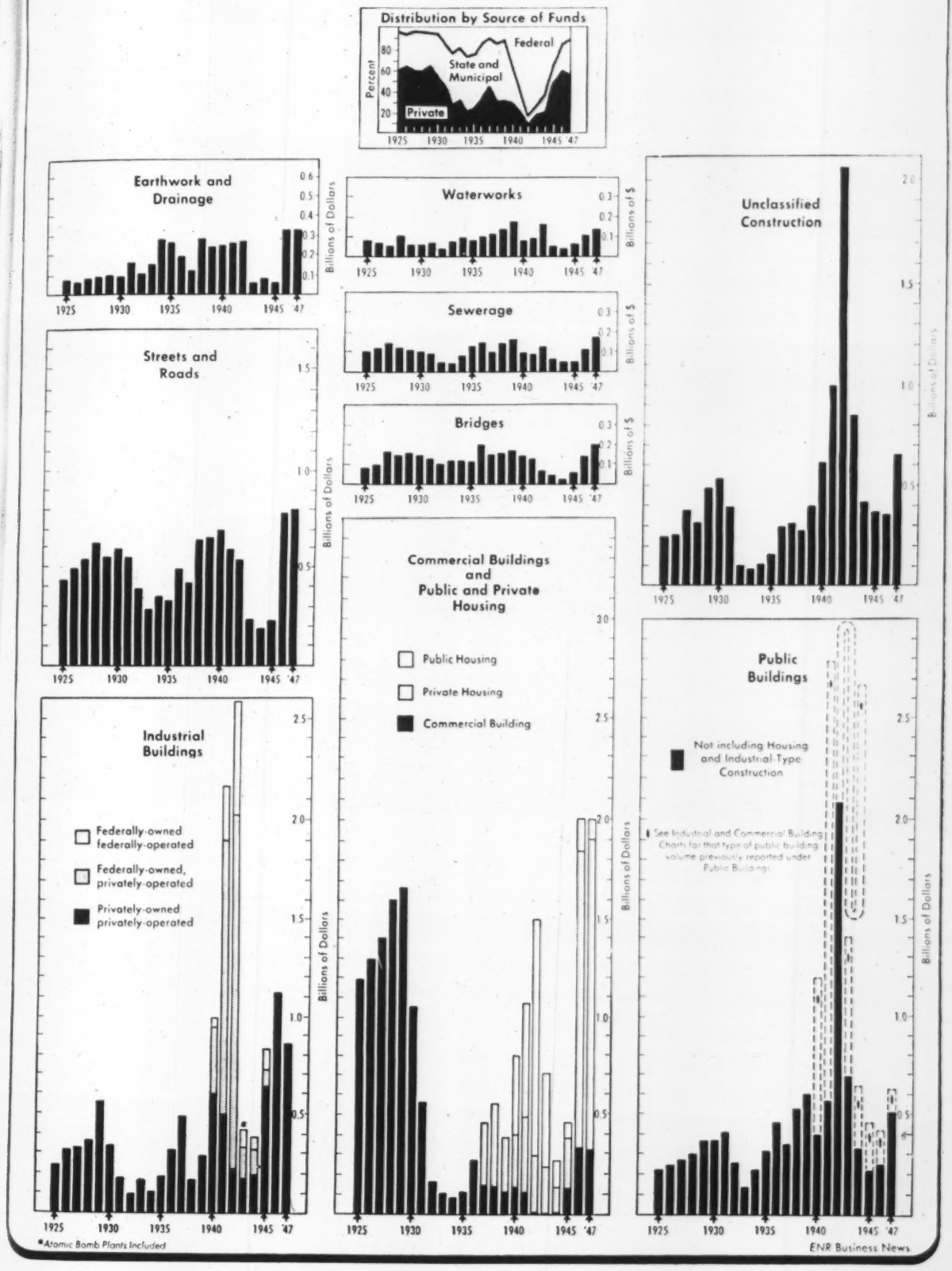
IV—ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD IN 1947

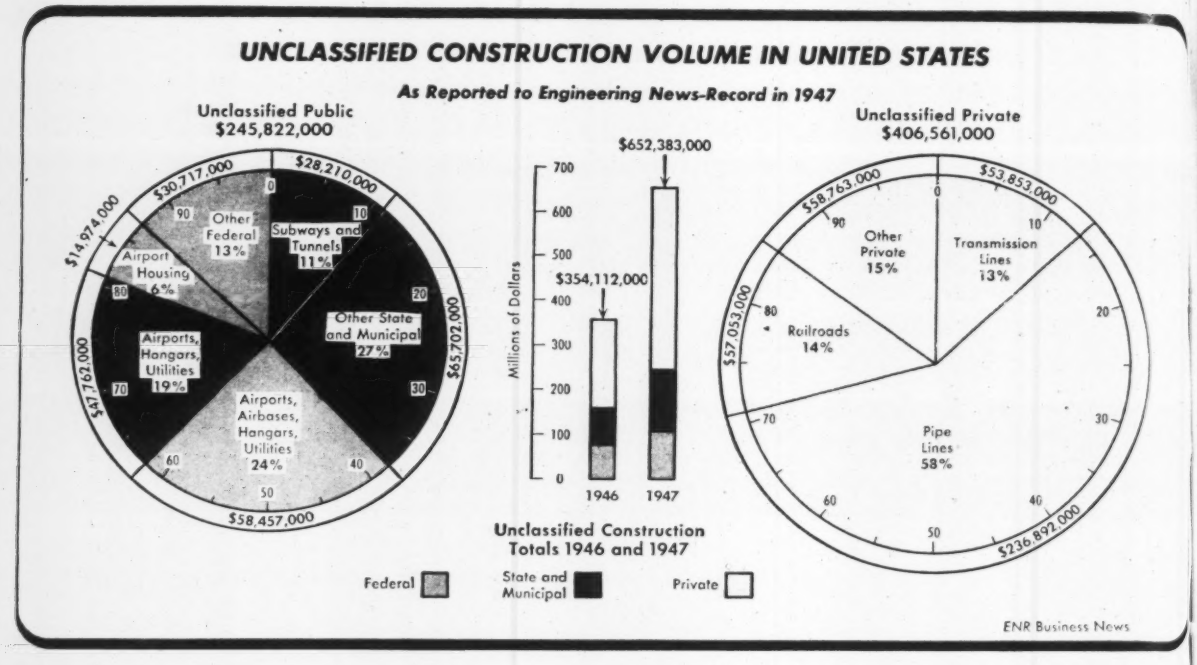
Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs—waterworks, excavation and irrigation,* $28,000; *other public works,* $50,000; *industrial buildings,* $68,000; *other buildings,* $250,000.

Thousands of Dollars (000 Omitted)

States	Public Works Contracts: Waterworks	Sewerage	Bridges	Earthwork Irr.-Drain.	Streets, Roads	Buildings	Unclassified	Federal Gov't. Work	Private Contracts: Bridges	Industrial Bldgs.	Commercial Bldgs.	Unclassified	Construction: Private	Public	1947 TOTAL	1946 TOTAL	Change 1946 to 1947
Maine	.....	.....	1,563	.....	2,729	353	14,306	14,306		.....	.....	.....	.....	18,951	**18,951**	30,411	— 38
New Hampshire	.....	.....	1,103	14	2,108	364	337	81		.....	.....	.....	.....	3,926	**3,926**	9,960	— 61
Vermont	.....	.....	127	.....	2,750	320	.....	860		.....	.....	.....	.....	3,197	**3,197**	7,374	— 57
Massachusetts	1,519	2,467	1,525	4,011	9,612	6,113	6,570	6,069		9,958	8,802	160	18,920	31,817	**50,737**	137,388	— 63
Rhode Island	212	.....	220	193	1,630	2,093	246	1,849		3,437	19,820	130	23,387	4,594	**27,981**	21,594	+ 30
Connecticut	388	472	6,857	1,521	5,803	11,260	233	2,626		28,760	42,736	1,190	72,686	26,534	**99,220**	85,781	+ 16
New England	**2,119**	**2,939**	**11,395**	**5,739**	**24,632**	**20,503**	**21,692**	**25,791**		**42,155**	**71,358**	**1,480**	**114,993**	**89,019**	**204,012**	**292,508**	— 30
New York	15,762	11,804	7,679	9,557	52,943	121,840	24,666	83,821		30,026	214,183	5,350	249,559	244,251	**493,810**	369,302	+ 34
New Jersey	161	1,750	5,738	3,208	14,406	20,783	935	9,633		46,155	132,508	859	179,522	46,981	**226,503**	105,699	+ 114
Pennsylvania	4,227	17,439	17,089	11,900	63,076	18,919	16,563	9,939		129,371	388,422	10,973	528,766	149,213	**677,979**	580,291	+ 17
Maryland	10,766	1,582	1,355	1,010	4,293	12,019	6,123	9,460	93	3,017	25,192	856	29,158	37,148	**66,306**	104,772	— 37
Dist. of Columbia	1,725	937	8,985	19	6,581	2,113	497	2,521		724	9,990	800	11,414	20,857	**32,271**	19,302	+ 67
Delaware	355	993	314	199	2,520	1,083	87	310		6,511	27,494	170	34,175	5,551	**39,726**	48,960	— 19
Middle Atlantic	**32,996**	**34,505**	**41,160**	**25,893**	**143,819**	**176,757**	**48,871**	**115,384**	**93**	**215,804**	**797,689**	**19,008**	**1,032,594**	**504,001**	**1,536,595**	**1,228,326**	+ 25
Virginia	1,694	3,791	7,503	1,329	18,505	11,224	6,557	14,638		5,065	10,790	7,600	23,455	50,603	**74,058**	59,019	+ 25
West Virginia	775	.....	4,292	4,630	7,657	603	57	5,288		2,920	904	12,333	16,157	18,014	**34,171**	33,289	+ 3
North Carolina	2,948	946	4,011	1,302	24,213	7,191	2,079	5,909		7,220	26,494	4,391	38,105	42,690	**80,795**	68,766	+ 17
South Carolina	1,406	1,719	3,368	15,896	15,010	3,107	1,613	20,065		9,929	11,203	1,001	22,133	42,119	**64,252**	91,609	— 30
Georgia	2,908	2,006	3,001	16,598	11,097	9,797	1,359	19,321		11,503	59,585	6,432	77,520	46,766	**124,286**	144,112	— 14
Florida	2,166	7,501	4,749	4,001	17,396	21,051	8,638	9,185	73	9,025	92,619	10,878	112,595	65,502	**178,097**	118,842	+ 50
Alabama	1,617	761	1,878	1,263	11,778	4,963	5,841	2,825		6,248	21,677	7,118	35,043	28,101	**63,144**	121,005	— 48
Mississippi	927	271	2,770	16,768	21,943	2,565	2,088	17,892		1,908	4,698	3,858	10,464	47,332	**57,796**	36,186	+ 60
Louisiana	566	1,215	3,955	17,744	16,794	17,283	2,191	23,936		39,016	32,033	3,407	74,456	59,748	**134,204**	48,928	+ 174
Kentucky	712	842	3,511	659	23,319	9,049	15,263	16,651		7,906	15,016	7,295	30,217	53,355	**83,572**	32,716	+ 155
Tennessee	2,403	1,547	5,294	3,149	18,277	12,263	1,363	9,888		6,376	29,565	3,970	39,911	44,296	**84,207**	109,674	— 23
Southern	**18,122**	**20,599**	**44,332**	**83,339**	**185,989**	**99,096**	**47,049**	**145,598**	**73**	**107,116**	**304,584**	**68,283**	**480,056**	**498,526**	**978,582**	**864,146**	+ 13
Ohio	10,303	6,432	2,068	4,823	35,179	17,348	2,456	5,678	228	23,709	73,870	3,280	101,087	78,609	**179,696**	180,992	— 1
Indiana	2,074	1,080	3,509	2,208	17,142	13,082	1,584	3,188		18,130	24,851	1,970	44,951	40,679	**85,630**	65,769	+ 30
Illinois	2,780	34,308	10,177	25,326	43,990	33,699	18,147	34,181	290	47,344	36,869	26,459	110,962	168,427	**279,389**	202,552	+ 38
Wisconsin	2,733	7,593	3,593	592	25,243	7,397	3,499	2,864		37,106	10,241	21,148	68,495	50,650	**119,145**	62,428	+ 91
Michigan	4,471	7,682	8,055	998	12,439	11,434	2,547	4,566		15,924	4,370	26,851	47,145	47,626	**94,771**	121,084	— 22
Middle West	**22,361**	**57,095**	**27,402**	**33,947**	**133,993**	**82,960**	**28,233**	**50,477**	**518**	**142,213**	**150,201**	**79,708**	**372,640**	**385,991**	**758,631**	**632,825**	+ 20
Minnesota	1,126	1,903	1,104	3,111	21,269	9,083	1,143	4,000		16,665	6,230	8,007	30,902	38,739	**69,641**	57,940	+ 20
Iowa	987	984	4,806	2,366	15,059	8,269	779	3,726		11,837	7,345	3,737	22,919	33,250	**56,169**	76,004	— 26
Missouri	898	751	9,494	5,588	13,580	15,739	954	15,457	40	21,969	55,753	13,827	91,589	47,004	**138,593**	124,155	+ 12
Arkansas	1,166	694	6,688	44,313	11,215	3,151	2,167	46,637		9,505	3,066	15,300	27,871	69,394	**97,265**	26,667	+ 265
North Dakota	792	573	.....	13,350	8,078	4,360	2,124	19,929		1,030	2,142	1,033	4,205	29,277	**33,482**	14,790	+ 126
South Dakota	857	580	620	1,243	7,260	3,491	4,216	8,689		1,013	3,260	1,532	5,805	18,267	**24,072**	18,209	+ 32
Nebraska	1,091	823	969	2,795	7,433	13,308	2,399	10,863		2,903	2,261	4,120	9,284	28,818	**38,102**	26,390	+ 44
Kansas	2,001	2,769	5,160	1,681	19,793	6,341	1,139	4,112		13,268	4,852	22,552	40,672	38,884	**79,556**	53,502	+ 49
Oklahoma	6,576	4,890	4,745	4,445	12,461	8,888	2,847	8,846		14,523	6,834	9,463	30,820	44,852	**75,672**	64,315	+ 18
Texas	10,533	20,220	8,017	14,644	71,170	35,527	14,651	23,145	350	131,520	145,926	99,866	377,662	174,762	**552,424**	485,860	+ 14
Montana	386	632	736	2,248	4,991	2,164	2,195	5,787	.....	11,306	17,641	383	29,330	13,352	**42,682**	19,813	+ 115
Wyoming	56	57	421	16,045	7,135	1,260	43	17,312	.....	3,701	.....	10,191	13,892	25,017	**38,909**	22,653	+ 72
Colorado	671	47	1,161	21,166	10,070	5,832	2,136	27,836	.....	9,738	275	6,554	16,567	41,083	**57,650**	28,970	+ 99
New Mexico	338	.....	146	1,025	7,919	5,623	7,519	14,072	.....	541	.....	7,986	8,527	22,570	**31,097**	22,095	+ 41
West of Mississippi	**27,478**	**34,923**	**44,067**	**134,020**	**217,433**	**123,036**	**44,312**	**210,411**	**390**	**249,519**	**255,585**	**204,551**	**710,045**	**625,269**	**1,335,314**	**1,041,363**	+ 28
Idaho	.....	.....	132	2,055	4,510	1,520	1,570	3,695	.....	4,208	15,757	690	20,655	9,787	**30,442**	20,068	+ 52
Utah	1,212	141	160	878	5,401	2,906	2,592	4,753	.....	7,918	2,001	6,199	16,118	13,290	**29,408**	9,637	+ 205
Arizona	1,680	.....	697	590	907	3,260	2,409	6,269	.....	175	750	1,831	2,756	9,543	**12,299**	37,759	— 67
Nevada	11	62	.....	86	3,586	3,010	1,441	2,448	.....	135	1,655	3,000	4,790	8,196	**12,986**	13,648	— 5
Washington	7,127	4,107	4,410	6,758	15,815	36,402	15,773	14,719	.....	11,266	42,965	1,400	55,631	90,392	**146,023**	157,996	— 8
Oregon	1,241	2,047	1,490	11,767	16,526	13,656	4,248	23,008	.....	7,951	8,495	2,838	19,284	50,975	**70,259**	163,422	— 57
California	24,794	18,346	19,978	21,784	41,522	52,386	27,632	53,866	.....	73,745	246,921	17,573	338,239	206,442	**544,681**	714,336	— 24
Far West	**36,065**	**24,703**	**26,867**	**43,918**	**88,267**	**113,140**	**55,665**	**108,758**	.....	**105,398**	**318,544**	**33,531**	**457,473**	**388,625**	**846,098**	**1,116,866**	— 24
U. S. 1947	**139,141**	**174,764**	**195,223**	**326,856**	**794,133**	**615,492**	**245,822**	**656,419**	**1,074**	**862,205**	**1,897,961**	**406,561**	**3,167,801**	**2,491,431**	**5,659,232**	.....	.....
U. S. 1946	109,159	113,589	126,579	327,605	769,387	414,087	157,957	599,271	2,092	1,113,251	1,846,173	196,155	3,157,671	2,018,363	.....	5,176,034	.....
% Change '46 to '47.	+27	+54	+54	— 0 2	+3	+49	+56	+10	—49	— 23	+3	+107	+0 3	+23	.....	.....	+ 9
Canada, 1947	**8,638**	**6,330**	**6,981**	**24,653**	**39,072**	**86,905**	**28,466**	.....	**250**	**126,438**	**70,527**	**48,419**	**245,634**	**201,045**	**446,679**	.....	+ 44
Canada, 1946	5,244	6,064	1,304	8,688	34,521	47,691	9,844	.....	400	116,668	63,278	16,399	196,745	113,356	.....	310,101	.....

ENR-REPORTED CONSTRUCTION VOLUME—BY CLASS OF WORK

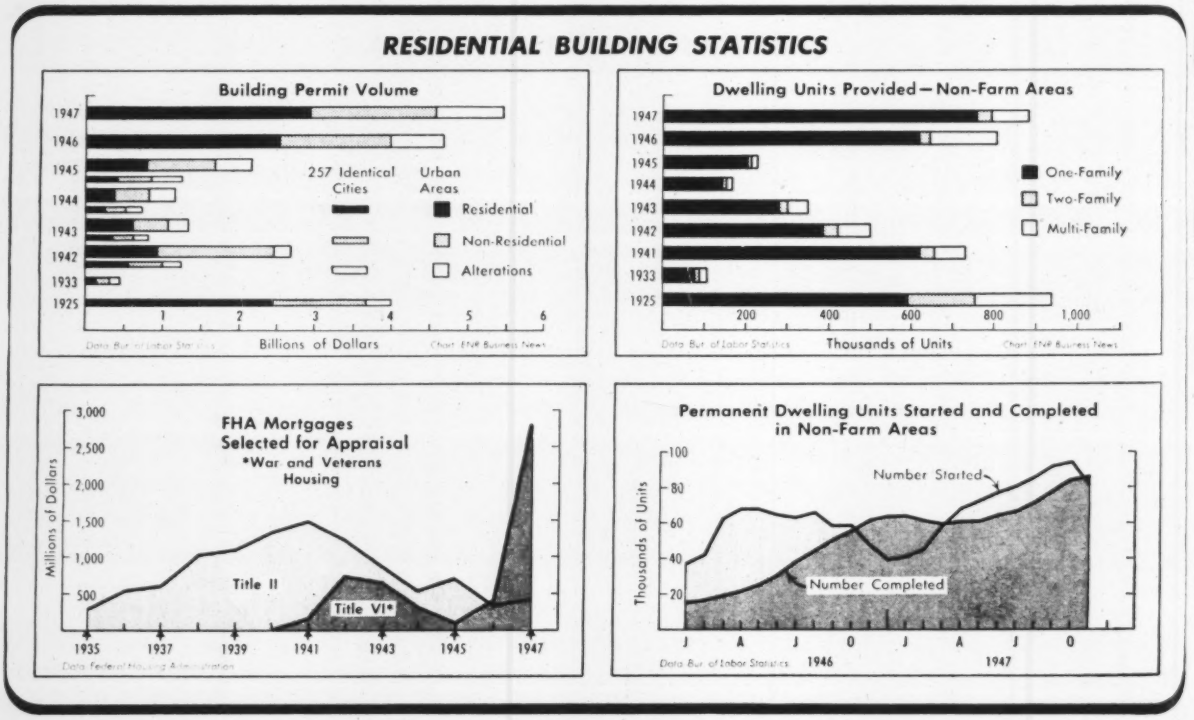




tion rose 107 percent over the 1946 volume to $406,561,000 and unclassified public construction, 56 percent to $245,822,000.

New pipe lines accounted for 58 percent of total private unclassified construction volume, or for $236,892,000. This was an increase of 447 percent over the $43 millions recorded in 1946. Railroads, recording a total of $57,053,000, increased 180 percent over 1946, while transmission lines declined 28 percent to $53,853,000.

In the public unclassified group, state and municipal contract volume, accounting for 58 percent of the public total, rose to $141,674,000 from the 1946 volume of $73,154,000, a gain of 94 percent. Federal construction accounted for 42 percent of the total public volume and rose to $104,148,000 from $84,803,000 in 1946, or 23 percent.



Geographically, four of the six sections of the United States showed gains in heavy engineering construction volume over 1946. West of the Mississippi, with a dollar volume of $1,335,314,000 for 1947 showed the greatest gain over 1946, rising 28 percent. Middle Atlantic recorded a volume of $1,536,595,000, 25 percent over 1946; Middle West, $758,631,000, 20 percent over 1946; South, $978,582,000, 13 percent over 1946.

Only Far West and New England dropped below the 1946 volumes. The dollar volume of construction in the Far West of $846,098,000 was 24 percent, and the New England total of $204,012,000, 30 percent, below the 1946 volumes.

RESIDENTIAL BUILDING

The Bureau of Labor Statistics estimates total permit valuations at a preliminary figure of $5,519,373,000 for 1947, 18 percent greater than the total valuations for the full year of 1946.

The number of dwelling units provided during the first 11 months of 1947 amounted to 822,900, according to the Bureau of Labor Statistics, compared with the 12-month total of 810,500 for 1946. Of the 1947 total, 815,329 units, or 99 percent were privately financed. Private dwelling units are comprised of 706,451 one-family dwellings, 33,347 two-family dwellings and 75,531 multi-family dwellings.

The number of new permanent dwelling units completed in non-farm areas was only 6 percent below starts in the first 11 months of 1947, a considerable improvement over 1946 when the number of units completed was 35 percent below starts.

V—NEW CONSTRUCTION CAPITAL

(Millions of Dollars)

	Corporate	State and Municipal	Federal	Total
1925	$1,966	$1,352		$3,318
1926	1,824	1,344		3,168
1927	1,784	1,475		3,259
1928	1,568	1,379		2,947
1929	1,758	1,418		3,176
1930	2,032	1,434		3,466
1931	787	1,235		2,022
1932	159	561		720
1933	292	1,091‡		1,383
1934	77†	1,011‡	194	1,282
1935	47†	1,337‡	1,354	2,738
1936	251	698	691	1,640
1937	518†	738‡	946	2,202
1938	457†	1,902‡	1,345	3,704
1939	804†	783‡	1,318	2,405
1940	624†	805‡	2,466	3,895
1941	741†	477‡	6,677	7,895
1942	332†	225‡	9,662	10,219
1943	56†	135‡	2,882	3,073
1944	194†	193‡	1,327	1,714
1945	286†	409‡	1,129	1,824
1946	662	848	1,940	3,449
1947	1,642	1,178	1,066	3,886

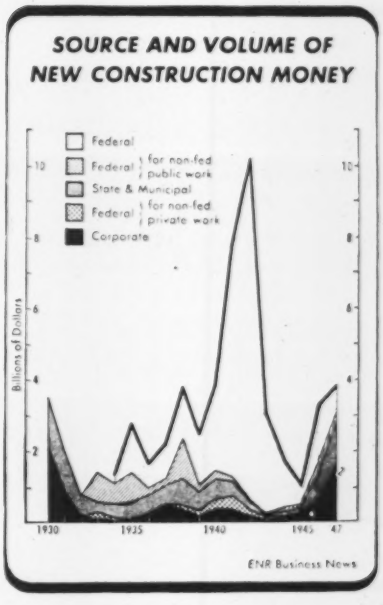
Note: Federal appropriations include federal aid highway, WPA, and regular departmental appropriations for construction

† Includes $237,000,000 RFC and PWA loans '33; $55,000,000, '34; $9,000,000, '35; $807,000, '37; $76,106,000 REA, $4,500,000 RFC loans, '38; $89,000,000 REA and $400,000 RFC loans, '39; $40,000,000 REA and $193,000,000 in RFC loans, '40; $100,500,000 in REA and $282,000,000 in RFC loans in '41; $149,800,000 in RFC in '42; $20,000,000 in REA and $14,030,000 in RFC in '43; $20,000,000 in REA and $61,440,000 in RFC loans in '44; $60,000,000 in REA and $24,400,000 in RFC loans in '45.

‡ Includes $814,000,000 RFC and PWA loans and grants '33; $580,000,000, '34; $808,000,000, '35; $164,700,000, '36; $207,000,000, '37; $723,265,000 PWA, $99,834,000 RFC, $320,98[illegible],000 USHA loans, '38; $216,000,000 in USHA loans, '39; $219,000,000 USHA, $5,000,000 RFC loans in '40; $30,000,000 in USHA, $6,900,000 in RFC loans in '41; $7,655,000 in RFC loans in '42; $3,133,000 in FPHA and $1,015,000 RFC loans in '43; $500,000 in RFC loans in '44; $200,000 in RFC loans in '45.

NEW CONSTRUCTION CAPITAL

New capital for engineering construction in 1946 totaled $3,885,786,000, 13 percent more than the $3,449,394,000 made available in 1946. This new capital is made up of $1,641,428,000 in corporate securities, $1,177,918,000 in state and municipal bonds, $247,711,000 in federal-aid highway funds and $818,729,000 in federal appropriations for departmental and other federal construction. Compared with 1946 totals, corporate securities showed a gain

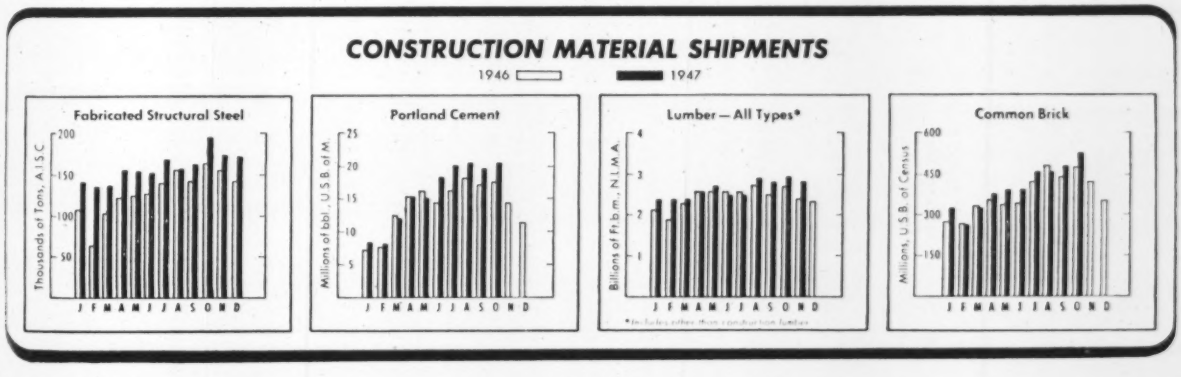


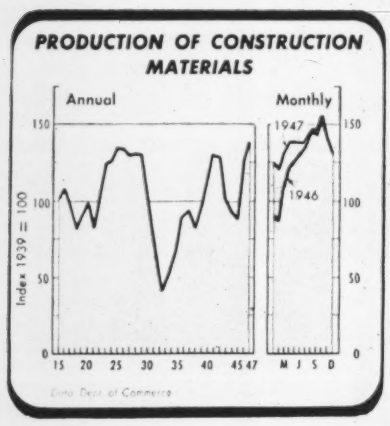
of 148 percent, state and municipal bonds, 39 percent and total federal funds appropriated for construction, a decline of 45 percent.

MATERIAL SHIPMENTS

Shipments of fabricated structural steel, estimated for the entire industry by the American Institute of Steel Construction, totaled 1,915,000 tons, an increase of 23 percent over the 1946 total of 1,552,000 tons.

Portland cement shipments, as reported by the U. S. Bureau of Mines, amounted to 158,749,000 bbls. for the first 10 months of 1947, 11 percent greater than the comparable 1946 total of 143,039,000 bbls. Shipments of lumber and brick showed the smallest gains, rising about 8 percent above 1946. Lumber shipments, compiled by the National Lumber Manufacturers Association, rose to 36,016,000,000 bd. ft. from





33,637,000,000 in the comparable 12-month period of 1946. Brick shipments, as reported by the Bureau of Census, rose to 4,496,000,000 units in the first 11 months of 1947 from the comparable 1946 total of 4,166,000,000.

MATERIAL PRODUCTION

The index of the output of construction materials, compiled by the Department of Commerce on the basis of 1939 as 100 and unadjusted for seasonal variation, averaged 137.6 for the first 11 months of 1947, indicating a new high production record for 1947. The previous record high was reached in 1925 when the index averaged 134.0. The final 1947 index will at best be only 2 to 3 percent above the 1925 peak, however.

EMPLOYMENT

Contract construction employment, as estimated by the Bureau of Labor Statistics, averaged 1,740,000 in 1947, 17 percent greater than the 1946 average of 1,492,600. Contract construction employment in 1947 was thus the third highest on record, exceeded only in 1941 and 1942 when employment averaged 1,789,600 and 2,160,500, respectively.

The number of apprentices employed in the construction industry is estimated by the Apprentice-Training Service at 114,363 on January 1, a new high. Compared with a year ago, when 89,300 apprentices were employed, the number on January 1 of this year rose 28 percent.

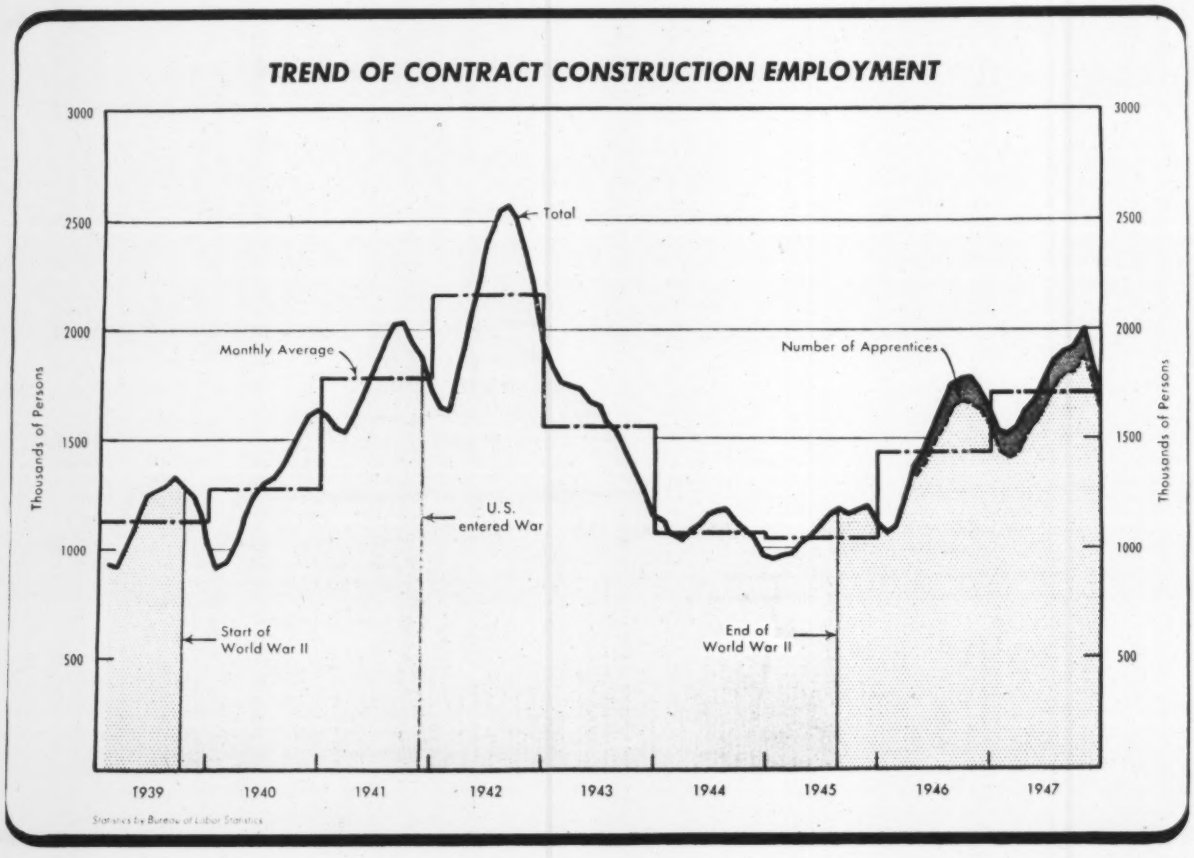
CONSTRUCTION COSTS

The *Engineering News-Record* Construction Cost Index, on the basis of 1913 as 100, reached a new record high of 432.30 at the end of 1947, a

VI—OUTPUT OF VARIOUS CONSTRUCTION MATERIALS FOR ELEVEN-YEAR PERIOD

Item	Basis	Unit	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
Lumber	Shipments	Millions Bd. Ft.	24,988	22,201	25,811	30,095	34,086	38,946	35,852	33,271	28,869	33,637	36,016
Cement	Shipments	Thous. Bbl	113,805	106,324	122,651	130,350	167,508	185,267†	127,632	94,272	106,398†*	169,336†	158,749(2)
Cement	Production	% Capacity	45.5	41.2	47.7†	51.2†	65.3†	74.0†	54.0†	31.9	43.0	68.0†	76.9(2)
Steel Ingots	Production	Thous. Net Tons	55,443	31,071	51,585	66,982	82,837	86,030	88,836	89,642	79,702	66,603	84,788
Steel Ingots	Production	% Capacity	72.4	39.7	64.7	82.1	97.3	96.8	98.1	95.5	83.5	72.5	92.3
Fabricated Structural Steel	Shipments	Thous. Tons	1,661	1,159	1,440	1,516	2,251	2,040	‡	‡	‡	1,552	1,915
Fabr. Str. Steel—Bridge & Bldg.	Shipments	Thous. Tons						1,678	832*	598*	797*		
Explosives	Shipments	Thous. lb	387,805	320,259	372,470	406,671	460,075	427,744	451,773	447,100	440,208	515,772	606,870
Brick	Shipments	Millions Brick	2,910	2,537	3,319	3,160	3,960	2,929	2,405	2,005	2,375	4,522	4,496(1)

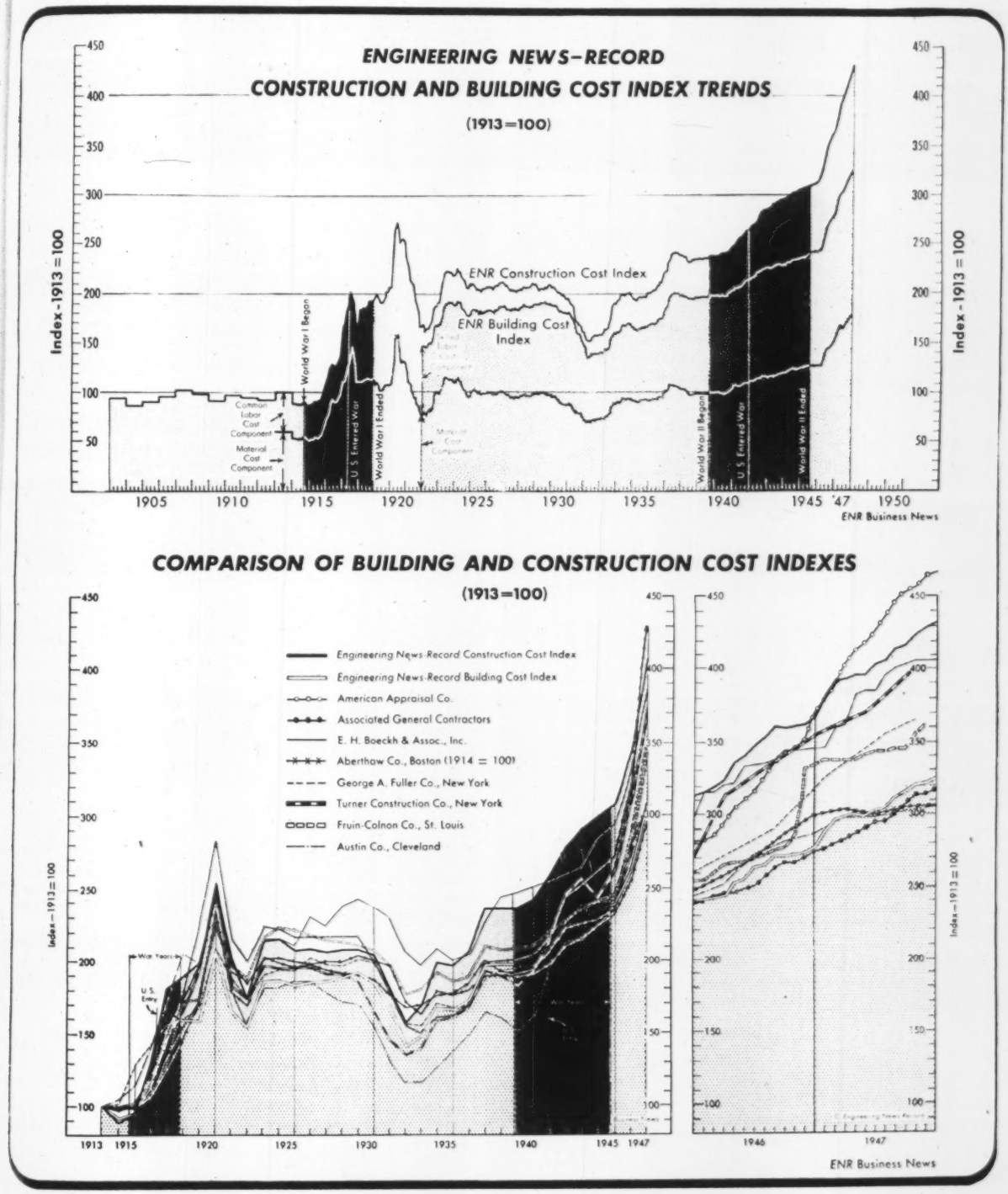
†Includes Puerto Rico and Hawaii* from May through December. (1) Eleven months' total. ‡A.I.S.C. estimated shipment data for entire industry discontinued. (Approximately 80% of industry. (2) Ten months' total. Includes Puerto Rico.

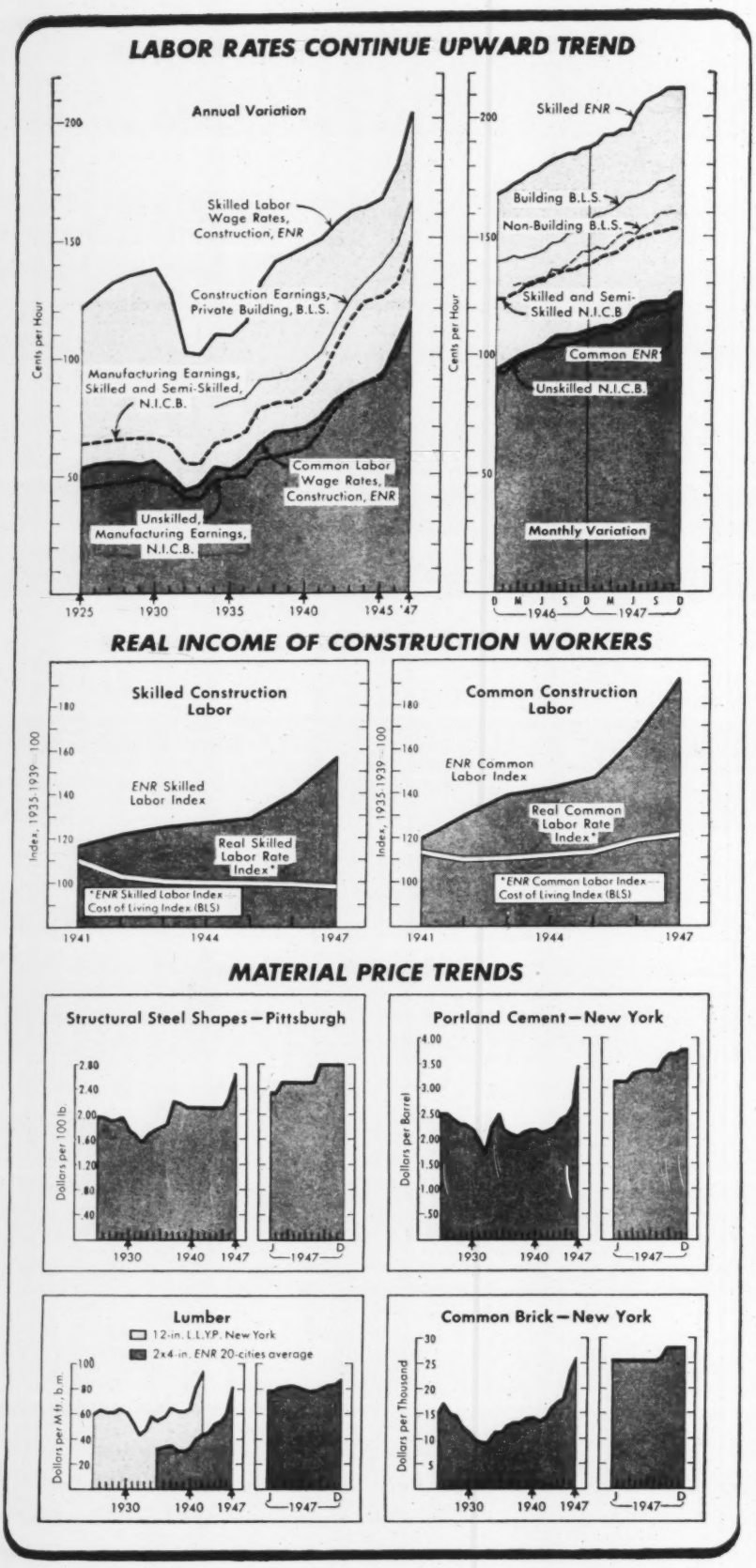


gain of 17 percent for the year. The *Engineering News-Record* Building Cost Index also reached an all-time high of 325.27, rising 17 percent during 1947.

Gains of 17 percent and 16 percent during 1947 in the E. H. Boeckh index of building costs and the Associated General Contractors index, respectively, paralleled increases in the *ENR* indexes. The American Appraisal construction cost index, however, showed an even greater gain of 26 percent.

Contractor indexes which are available for a comparable period showed smaller gains during 1947 than the weighted indexes. The Fruin-Colnan index rose 9 percent; the Austin, 7 percent and the Aberthaw, 2 percent. The Turner index rose 10% from December, 1946 to October 1947. Contractor indexes are adjusted for "hidden" cost elements such as overtime payments, job productivity and the availability of materials and labor.





WAGES AND EARNINGS

Straight-time wages of common and skilled construction labor as measured by *Engineering News-Record's* 20-cities average, rose 16 percent and 14 percent, respectively, during 1947 to the highest rates on record. Common construction wages rose from $1.867 per hour at the end of 1946 to $2.120 at the end of 1947 and skilled wages from $1.085 per hour to $1.260.

Average hourly earnings on private construction projects, as compiled by the Bureau of Labor Statistics, rose 12 percent from the end of 1946 to November, 1947, the latest month available for comparison. Building construction earnings rose to $1.761 per hour in November from $1.569 in December, 1946 while non-building construction hourly earnings rose to $1.610 from $1.434. Skilled manufacturing hourly earnings from the National Industrial Conference Board rose 11 percent for a comparable period, and unskilled earnings, 13 percent.

Real income of common construction labor rose only 0.6 percent on the average from 1946 to 1947, however, while the real income of skilled labor declined 1.7 percent.

MATERIAL PRICE RISES

Lumber prices made the greatest gains during 1947, rising 22 percent from December 1946 to December 1947, despite the slight weakening of lumber prices during June and July last year. The *ENR* 20-cities average of 2x4 Pine and Fir lumber rose to $86.21 per M ft. b.m. at the end of 1947 from the 1946 year-end price of $70.60. The base price of structural steel at Pittsburgh rose 19 percent from $2.35 per cwt. in 1946 to $2.80 at the end of 1947. Prices of common brick in New York rose 10 percent to $28.00 per M.

Chicago cement prices, which include the dealer's commission but not the cost of bags, showed the smallest gain during 1947 of 6 percent. The f.o.b. price rose to $2.75 per bbl. in December 1947 from $2.59 per bbl. at the end of 1946. Cement prices in New York, as seen on the accompanying chart, however, rose 19 percent during 1947. N. Y. price is a delivered price and includes the cost of paper bags.

Road Expenditures at New High Level

A tabulation of the highway expenditures in 1947 and of the planned work for 1948 is given in a table on the following page.

HIGHWAY EXPENDITURES for construction and maintenance in 1947 totaled to $1,341,000,000, which is a new high level for the state and federal-aid work, and outlays in 1948 should go to $1,500,000,000. This conclusion is based on an analysis of reports on expenditures and planned work made to *Engineering News-Record* by the state highway departments, summaries of which are tabulated on the following page. All 48 states reported their 1947 costs and only three were unable to supply budget figures or estimates for 1948. Without the figures for these three states (New York, Mississippi and Missouri) the 1948 estimate total to $1,373,348,000, and if it is assumed that these three states will increase their expenditures at the average rate for the other states, the total will be around one and one-half billion. This would be a 12 percent increase over 1947.

Gain over 1946

Recorded expenditures for 1947 are more complete than those reported to *ENR* for 1946, but by using comparable states, a 33 percent gain over 1946 is indicated for the 1947 figures. This is only 11 percent below what state highway executives hoped to do in 1947 had engineers, materials and workmen been in better supply.

The carry-over of uncompleted contracts into 1948 is $126,000,000 higher than the corresponding carry-over from 1946 into 1947 but it is a smaller ratio of the new contracts awarded during the year.

Programmed work for 1948 shows an increase of 20 percent in work to be done by contract and a decrease of 29 percent in new construction to be handled by state forces. Similarly, maintenance by contract shows an 8 percent increase as compared to a 6 percent increase in maintenance by state forces.

Maintenance by contract

Probably the most interesting development of 1947 was the fact that 14 percent of the total maintenance was done by contract. In the 31 states which report maintenance by contract, it is 17 percent of the total. In the Middle West, where every state reports contract maintenance, it is 24 percent of the total. Michigan reports the largest volume of contract maintenance, $8,211,000 or 77 percent of the state's $10,684,000 total maintenance. Michigan also budgets an 8 percent increase in contract maintenance and a slight decrease in maintenance by state forces in 1948. An overall increase in all states of 8 percent in contract maintenance is on the program for 1948 but 3 of the 31 states that put maintenance under contract in 1947 do not now plan to do so in 1948.

The largest maintenance program is reported by Pennsylvania, $26,000,000, all by state forces. New York is second with $21,330,000, $21,244,000 by state forces and $86,000 by contract. Ohio is third with $20,000,000, $16,000,000 by state forces and $4,000,000 by contract. North Carolina reports $18,750,000 by state forces, and West Virginia, $17,904,000, $15,900,000 by state forces, $2,004,000 by contract. Virginia reports $16,848,000, $13,832,000 by state forces and $3,016,000 by contract: Texas, $16,365,000, all by state forces and California, $15,003,000, $14,600,000 by state forces and $403,000 by contract.

New construction

Total new construction started in 1947 was $928,245,000, $881,316,000 by contract and $46,929,000 by state forces in two states.

The largest new construction program in 1947 was in Pennsylvania, $103,000,000, with $71,000,000 put under contract and $32,000,000 handled by state forces. Texas was second with an $83,146,000 contract program and California third with $70,300,000 put under contract. New York state followed with $43,936,000 contracted and North Carolina reported $39,059,000, $24,130,000 put under contract and $14,929,000 handled by state forces. Ohio let $33,000,000 by contract.

Smaller highway programs than in 1947 are expected in 1948 in the District of Columbia, in West Virginia, North Carolina, Illinois, Arkansas, Texas, Colorado and Idaho. The District of Columbia has a large carry-over of work from 1947. West Virginia's increased carry-over balances the decrease in planned new commitments, but North Carolina's carry-over of uncompleted work is only moderate and does not offset the budget drop. Illinois has a large carry-over but Arkansas has only a moderate volume and not enough to offset the budget decrease. Texas has a large carry-over but not enough to offset the budget decline. Colorado has a large carry-over, more than enough to offset the slight budget reduction, but Idaho has a smaller carry-over than a year ago.

Equipment purchases

Equipment purchases in 1947 amounted to $54,979,000 with figures for only two states missing. Five states were unable to provide estimates for 1948 purchases, but the remainder expect to spend $43,003,000 for equipment in 1948, which would be a decline of around $8,000,000 from their 1947 outlays. This probably indicates that the 1947 figures include abnormal expenditures to make up for the inability of the highway departments to purchase sufficient equipment during the war years.

Miles of highway built

During 1947, 3,721 miles of highway were hard-surfaced, 23,828 miles received a bituminous treatment, and 11,053 were built or rebuilt with aggregate or soil surface. Figures for only one state are missing in this total. Grading and drainage amounted to 24,302 miles.

STATE HIGHWAY PROGRAMS—1947-1948

Reported to Engineering News-Record by State Highway Executives

Expenditures, 1947—Budgets or Estimates for 1948—Thousands of Dollars (,000 omitted)

Information on which the accompanying table is based was supplied by the following highway officials: Maine, Lucius D. Barrows; New Hampshire, D. H. Dickinson; Vermont, H. E. Sargent and L. T. Hayward; Massachusetts, P. H. Kittield; Rhode Island, G. H. Henderson; Connecticut, G. Albert Hill and W. C. Murray; New York, Chas. H. Sells and C. A. Bonaparte; New Jersey, Charles M. Noble; Pennsylvania, E. L. Schmidt; Maryland, William F. Childs, Jr.; District of Columbia, H. C. Whitehurst; Delaware, W. A. McWilliams and D. B. LaPrade; Virginia, C. S. Mullen and D. B. Bolton; West Virginia, M. L. O'Neale and Robb Gover; North Carolina, W. Vance Baise; South Carolina, S. N. Pearman; Georgia, Roy A. Flynt; Florida, Herndon P. Colonev and C. H. Jeffords; Alabama, Ward W. McFarland and A. Reese Harvey; Mississippi, R. A. Harris; Louisiana, N. E. Lant; Kentucky, T. H. Cutler, Ben P. Barron and Vear Mann; Tennessee, W. T. Brooks and L. N. Means; Ohio, Murray D. Shaffer and George J. Thormyer; Indiana, C. E. Vogelgesang; Illinois, W. W. Polk; Wisconsin, E. L. Roettiger; Michigan, H. C. Coons; Minnesota, O. L. Kipp; Iowa, Fred R. White and Frank B. Howell; Missouri, C. W. Brown and G. M. Threlkeld; Arkansas, A. E. Johnson; North Dakota, M. P. Wynkoop; South Dakota, H. C. Rempfer; Nebraska, R. F. Weller; Kansas, R. C. Keeling; Oklahoma, H. E. Bailey; Texas, D. C. Greer and Wm. B. Alderman; Montana, H. W. Holmes; Wyoming, J. R. Bromley; C. W. Beaver; Colorado, Mark U. Watrous; New Mexico, B. G. Dwyre; Idaho, James Reid; Utah, Roy W. McLeese; Arizona, W. C. Lefebvre; Nevada, W. T. Holcomb and C. V. Melarkey; Washington, C. B. Shain and C. E. Simpson; Oregon, R. H. Baldock; California, G. T. McCoy.

States	Miles Built, 1947: Hard Surface	Miles Built, 1947: Bituminous Aggregate	Miles Built, 1947: Grade Soil	Miles Built, 1947: Grade Drained	Miles Built, 1947: Total	Bridges and Structures	Carryover Into 1948 Increase from 1947	Expenditures: New Contracts 1947	New Contracts 1948	Maintenance: By State Forces 1947	Maintenance: By State Forces 1948	Maintenance: By Contract 1947	Maintenance: By Contract 1948	Total Constr. & Maint. 1947	Total Constr. & Maint. 1948	Percent Increase 1948	Equipment Purchases 1947	Equipment Purchases 1948
Me.	26	26	.....	.....	52	42	$384	$1,410	$4,695	$8,300	$8,225	$108	...	$12,818	$12,890	0 6	$150	$150
N. H.	24	39	.....	.....	63	11	115	3,322	11,700	3,200	3,400	...	...	6,522	15,100	132	240	229
Vt.	.....	136	.....	.....	136	66	416	3,083	4,700	2,500	2,500	...	...	5,583	7,200	29	375	75
Mass.	95	5	.....	.....	103	32	−300	12,000	25,000	3,800	6,000	230	475	16,030	31,475	96	550	750
R. I.	8	2	.....	.....	10	6	850	1,800	4,000	1,500	1,700	...	...	3,300	5,700	73	75	100
Conn.	14	2	56	8	85	29	467(1)	12,269	20,000	3,952	4,000	...	...	16,221	24,000	48	1,685	1,040
New Eng.	**167**	**215**	**56**	**11**	**449**	**186**		**36,884**	**70,065**	**23,252**	**25,825**	**338**	**475**	**60,474**	**96,365**	**59**	**3,075**	**2,344**
N. Y.	127	482	.....	35	644[3]	350	4,716	43,986	...	21,244	...	86	...	65,316	...	...	1,556	...
N. J.	11[3]	3	1	15[3]	26	32	31,000	24,700	48,800	6,481	7,000	...	...	31,181	55,800	79	888	890
Pa.	400	600	800	.....	1,800	[3]	5	103,000[3]	117,000[17]	26,000	27,000	...	...	129,000	144,000	12	4,000	2,000
Md.	15	111	30	.....	156	13	10,132	5,607	39,545	3,900	4,200	...	...	9,507	43,745	360	700	900
D. C.	13	4	5	.....	22	2	−264	15,446	5,401	862	1,000	411	450	16,719	6,851	−59	131	125
Del.	.....	60	4	.....	64	5		3,089	4,000	1,560	1,560	350	350	4,999	5,910	18	175	75
Mid. Atl.	**566**	**1,260**	**840**	**50**	**2,715**	**87(1)**	45,589(1)	**195,828**[3]		**60,047**		**847**		**256,722**			7,250	
Comparable States	**(1 missing)**						13,530	**151,842**[3]	**214,746**[17]	**38,803**	**40,760**	**761**	**800**	**191,406**	**256,306**	**34**	**5,694(1)**	**3,990(1)**
Va.	40	1,975	1,826	4	3,845	374	2,635	4,444	27,325	13,832	12,000	3,016	2,400	21,292	42,325	94	3,839	3,000
W. Va.	17	32	41	69	158	25	2,859	10,384	11,000	15,900	12,000	2,004	2,000	28,288	25,000	−2	3,500	2,000
N. C.	33	1,972	1,064	1,891	4,960	83	956	39,050[3]	33,000[19]	18,750	18,750	...	...	57,809	51,750	−10	3,734	3,250
S. C.	3	927[3]	14	.....	944	54	−9,746	16,200	18,000	4,521	4,500	2,170[3]	2,000	22,900	24,500	7	600	1,000
Ga.	8	489	30	9	535	15	3,948	17,905	26,000	4,123	5,000	1,094	2,500	23,122	33,500	45	657	650
Fla.	.....	372	.....	9[3]	381	...	−8,110	25,524	28,036	4,200	6,500	1,982	2,250	31,706	36,786	16	1,339	1,500
Ala.	.....	589	12	57	658	40		11,901	12,500	3,696	3,500	459[20]	500	16,056	16,500	3	612	750
Miss.	257	313	21	408	999	222	2,442	21,811		3,348				25,159			1,200	
La.	42	351	231	26	650	...		23,675	28,000	9,273	10,000	3,305	1,200	36,253	39,200	8	2,003	2,000
Ky.	114	1,332	...	416	1,653	10	1,000	23,000	17,000	8,467	8,500	...	...	31,467	25,500	19	1,260	1,000
Tenn.	499	407	...	...	1,322	20		24,913	24,000	3,000	4,000	1,500	1,750	29,413	29,750	2	1,200	1,500
South.	**1,013**	**8,759**	**3,239**	**3,096**	**16,105**	**843(2)**	9,505(2)	**218,816**[3]		**89,110**		**15,539**	**14,600**	**323,465**			**19,944**	
Comparable States	**(1 missing)**						10,700	**197,005**[3]	**224,861**[19]	**85,762**	**85,350**	**15,539**	**14,600**	**298,306**	**324,811**	**9**	**18,744(1)**	**15,650(1)**
Ohio	28	2,409	553	...	2,990	102	1,122	38,000	40,000	16,000	18,100	4,000	5,500	58,000	63,600	10	1,500	800
Ind.	300	170	25	24	519	52	9,155	19,161	20,000	6,530	6,530	346	350	26,037	26,880	3	395	300
Ill.	390[3]	258	155	45	848[3]	49[3]	9,172	33,412	30,000	9,310	9,550	160	200	42,882	39,750	−7	1,000	2,000
Wis.	212	1,452[3]	738	155	2,557	7	792	23,000	33,000	7,161[3]	10,200[3]	540	1,000	30,701	44,200	44	...	...
Mich.	66	254	742	54	1,116	41	30,941	25,107	26,000	2,473	2,320	8,211	8,918	35,791	37,239	4	642	574
Mid. West	**996**	**4,543**	**2,213**	**278**	**8,030**	**244(1)**	1,498	**138,680**	**149,000**	**41,474**	**46,700**	**13,257**	**15,968**	**193,411**	**211,668**	**9**	**3,537(1)**	**3,674(1)**
Minn.	84	355	150	325	914	30	−634	16,232	16,000	8,400	8,500	2,600	2,750	27,232	27,250	...	800	...
Iowa	50	50	90	138	298	3[3]	9,057	10,000	15,000	4,390	4,482	1,010	1,100	15,400	20,582	34	773	1,000
Mo.	145	697	506	...	1,348	151	2,610	18,500	...	8,695	8,900	...	...	27,106	...	...	...	...
Ark.	20	422	113	16	571	53	1,410	16,394	9,000	5,417	6,000	...	...	21,811	15,000	−31	756	750
N. D.	20	86	460	256	822	1	−481	3,212	6,300	1,170	1,000	590	500	4,972	7,800	57	550	500
S. D.	.....	198	290	256	744	40	500	7,392	15,000	2,300	2,350	650	1,100	10,342	18,450	78	404	300
Neb.	23	165	231	317	736	64	97	8,500	12,000	3,700	3,200	900	1,000	13,100	16,200	24	800	900
Kan.	52	771	1,060	578	2,461	112		22,494	23,000	5,400	5,800	1,550	1,500	29,444	30,300	3	1,030	1,000
Okla.	125	750	849	30	1,754	73	−23,818	7,537	28,000	2,629	4,500	1,009	2,200	11,175	34,700	121	435	700
Tex. [f]	362	3,074	178	432	4,046	...	−3,500	83,146	50,000	16,365	16,000	...	...	99,511	66,000	−34	3,860	3,000
Mont.	.....	90	47	28	165	33	400	4,100	6,000	4,075	4,700	325	300	8,500	11,000	29	900	1,000
Wyo.	1	116	135	38	400	...	8,465	7,000	8,000	1,700	2,000	...	...	8,700	10,000	15	800	800
Colo.	.....	471	39	18,058	290	58	−982	14,000	13,000	1,900	1,800	...	...	15,900	14,800	−7	406	400
N. M.	**882(1)**	**7,245(1)**	**4,118(1)**	**20,472(1)**	18,567	7		7,156	8,500	2,768	2,250	294	...	10,218	10,750	5	828	350
W. of Miss.					**33,117**	**668(2)**	42,258(1)	**229,551**		**68,820**	**71,482**	**8,928**	**10,450**	**307,299**				
Comparable States	**(1 missing)**						−2,665	**211,051**	**209,800**	**60,214**	**62,582**	**8,928**	**10,450**	**280,193**	**282,832**	**1**	**11,542(2)**	**10,700(2)**
Idaho	3	164	44	1	213	11	2,510	4,500	4,000	2,050	2,300	543	700	7,093	7,000	−1	402	400
Utah	1	170	24	26	220	16	250	4,715	5,000	2,200	2,200	341	350	7,256	7,550	4	557	400
Ariz.	1	148	28	1	178	52	−1,303	7,796	8,000	1 535	1,500	...	...	9,331	9,500	2	206	250
Nev.	...	64	77	...	141	5	−500	2,905	10,681	1,000	1,397	...	...	3,905	12,078	209	350	400
Wash.	3	303	164	144	614	50	1,370	13,500	14 500	6,300	6,000	...	...	19,800	20,500	4	300	700
Ore.	45	250	250	195	740	28	−2,990	4,770	6,100	6,470	7 680	400	400	11,640	14,180	22	860	1,100
Calif.	44	707	...	28	779	202	−3,028	70,300	70,000	14,600	17,550	403	...	85,303	87,550	3	3,400	3,400
Far West	**97**	**1,806**	**587**	**395**	**2,885**	**364**		**108,486**	**118,281**	**34,155**	**38,627**	**1,687**	**1,450**	**144,328**	**158,358**	**10**	**6,075**	**6,650**
U. S.	**3,721(1)**	**23,828(1)**	**11,053(1)**	**24,302(1)**	**63,301**	**2,392(6)**		**928,245**		**316,858**		**40,596**		**1,285,699**				
Comparable States (3 missing)							+125,732(5)	**843,948**	**986,753**	**283,660**	**299,844**	**40,510**	**43,743**	**1,168,118**	**1,330,340**	**14**	**51,423(5)**	**43,008(5)**
Percent Increase over previous year									**+17%**	...	**6%**		**8%**		**14%**			**−16%**

( ) Figures in ( ) are number of states missing in total. f—fiscal year.

[3] 86 mi. State-Aid Rds. [4] Includes State Aid. [5] Plus 477 mi. retreatment. [6] Retreatment—Both Contr. and State. [9] By County. [8] Culverts 278. [7] Structures $4,000,000. [3] 3.69 mi. dual, 6.96 mi. multi-lane. [9] Multi-lane. [10] Incl. 972 mi. of retreatment. [11] Plus 269,480 sq. yd. concrete patching. [12] Includes 7 R. R. Grade separations, 5 highway grade separations but excludes 39 culverts, and 10 bridges widened. [13] Plus guardrail, 42.15 mi., traffic signals 4.36 mi., sewer 0.13 mi., landscaping 2.68 mi. [14] Plus 4 bridges lengthened. [15] Contracted, not completed. [16] Incl. 32,000 by state forces. [17] Incl. 20,000 by state forces. [18] Incl. 14,920 by state forces. [19] Incl. 13,000 by state forces. [20] Incl. in new construction.

World Construction Report—

A 37-nation survey discloses need for power, equipment, and technical knowledge

DESPITE political and economic uncertainties the whole world is trying to build again. Engineers are slowly cutting into the vast war-created demand that only construction can satisfy—the need for power, for water, for sanitation, for manufacturing plant, which is manifest from Finland to Australia and almost everywhere between.

A 37-nation report, prepared by *Engineering News-Record* from its own sources and through the staff of the *McGraw-Hill World News Service* brings the world construction picture into sharper focus. It points up the urgency for development of power as well as the need for construction "know-how", and reveals the division in objectives between Europe and the rest of the world.

Sparked in part by war-taught dangers of dependence on foreign fuel sources and in part by the needs of national industry, transport and domestic service, the drive for development of power takes precedence. Agrarian India, newly free and beset by serious political upheavals, already is planning vast expenditures to develop power from its many rivers; France, Switzerland, Sweden, Russia are overriding even the urgent need of housing to build great dams and stations; Afghanistan, Australia, South America, are searching their lands for power sources.

Most of the world, pushing this and other programs, looks to the United States for the equipment and the "know-how"—but in varying degrees.

The equipment and the technical information find an open welcome everywhere and the money is being found, somehow, to pay for them. But the demand for U.S. technical personnel—civil engineers and others—varies in direct proportion to the availability of trained nationals. For this reason, much of Europe seems closed to American contractors and civil engineers, (excepting as individual employees of foreign firms), and the demand goes up as work gets away from highly-developed areas.

Away from Europe, dozens of U. S. consulting engineering and contracting firms, hundreds of technicians—and the sales and engineering staffs of the manufacturers—are moving energetically and with purpose.

In objectives, European needs stand apart from the rest of the world. Nearly three years after the capitulation of the German armies, the war-ravished nations of Europe still find their biggest task is reconstruction—the long, tedious task of clearing rubble; the endless, nagging details of trying to keep patched-up, worn-thin transport systems in operation until replacements can be obtained; the clearing of ports and harbors; reconstruction of bridges—and most important, finding housing.

Orienting themselves principally to an effort to regain their former status of prosperity and position, what these nations have managed to do "on their own" is in itself remarkable. The dikes have been repaired, the ports are usable, the railroads function. Russia and its satellites—behind a tight screen of censorship—apparently have also made strides. The great Dnieperstroy power station is again in operation; builders are even pushing a new subway beneath teeming Moscow. Poland has restored some of its railroads and canals; Czechoslovakian industry is in operation.

The "rest of the world" looks to the future in its construction planning. Australia wants to convert its vast deserts into sites for farmland and industry; the great oil fields of the Middle East are being improved, brought closer to manufacturing centers by great pipelines and new transport systems; South Africa plans tremendous works to convert large areas for industry and food production; South and Central American nations look to a diminishing of their role as a supplier of raw materials to the world through establishment of new industry.

Briefly, country-by-country, here are "situation reports" on construction:

EUROPE REACHES FOR PREWAR STATUS

BELGIUM—Belgian construction has had to wait for large scale recovery in the production of food and clothing. In 1947, through its Ministries of Power, Agriculture, and Public Health, the government sponsored construction of inexpensive dwellings and farm buildings, and a large share of home building was done by private enterprise.

Despite absence of government aid for this purpose, reconstruction of industrial and commercial plants is almost complete, and many public works have been put under construction. Construction labor is short, with the corollary that construction in Belgium is a fertile field for labor-saving machinery and materials. Most needed, outside of machinery, are U.S. production technique for prefabrication of all types of structures.

ENGLAND—Continued shortages of timber and steel restricted civilian construction during the year to essential needs, and may hold down projects during 1948. The timber shortage was tied up with the nation's financial difficulties, since imports from so-called "dollar" countries were curtailed by $20,000,000 and alternate sources were unable to supply sufficient suitable grades.

However, the nation managed to complete some 136,000 permanent

and 45,000 temporary houses and had 260,000 permanent houses under construction at the year's end. During the coming year, construction of sufficient housing for the population and completion of war damage restoration is expected to be completed. Biggest project other than housing now under way is an electric power station for London under construction on the banks of the Thames River and several power projects being built in Scotland and in Wales.

FINLAND—With the double necessity of providing war reparations and livelihood for its citizens, Finland has plunged into a large-scale power and industrial program. Ten iron and steel foundries have been or are being constructed and a corresponding number of works for the electrical industry and shipyards are also under way.

The power economy was badly upset by peace treaties which ceded areas from which nearly 30 percent of the country's water power was drawn. To cover this loss, a large program of construction of power plants is being carried out, including ten power stations which will total an annual output of about 2,000,000 kwh with a future program to produce about the same amount at a later date. Largest hydro work under construction is on the Oulu River, to take advantage of a 150 ft. drop in the water level. Other power projects are being prepared on the Kemi River and the Vuoksi River.

In addition to the industries built for war indemnity, a number of other industrial plants have been or are being constructed. Most of these are concerned with the production of wood derivative projects—for housing, fibreboard, paper, cellulose and similar products.

FRANCE—Despite political upheavals and other troubles, construction activity in France during 1947 is now officially estimated at nearly $4,000,000,000 in United States values, a rise of 20 percent in volume over 1946. Government sources, decrying "huge" price rises, said that in the hydro-electric program alone price increases since early 1947 have added 135 percent to the estimated cost.

Most important is the hydro program—almost the only part of the reconstruction program working fully on schedule. Work has started on nearly all the planned sites—representing a hoped-for capacity of 11,500,000,000 kwh. annually—as much as France's total prewar hydro output. The new Genessiat dam is already in operation and much other work is under way.

Construction activity in the railroad, highway and port fields finally shifted to permanent reconstruction of hastily-built provisional bridges and harbor installations. The railroads completed electrification from Sete to Nimes. Of a total of 7,500 road bridges destroyed or damaged, 2,300 are now permanently rebuilt, while more than two-thirds of the 2,500 railroad bridges and tunnels are also back in prewar condition.

The government spent slightly over one billion dollars through its Reconstruction Ministry and expects to spend about the same amount in 1948, with activity also shifting from temporary to permanent reconstruction in the way of homes and industrial plants.

GERMANY—Under direction of the Allied military authorities, the restoration of bridges on key rail and road networks and rehabilitation of railroad installations continued to hold top priority for the very inadequate materials available for heavy construction.

Latest addition to the Stockholm highway system is the $4,600,000 Skanstull Viaduct, a 960-ft. structure carrying a 115-ft. roadway across one of the Swedish capital's many deep-cut waterways. Center span has a clearance of 107 ft. over water to allow passage of seagoing vessels.

A variety of semi-permanent and makeshift bridges had to suffice and very few projects involving replacement of original structures were authorized. Production of prefabricated housing got off to a feeble start in the U.S.-British area, and only two sizable housing projects were started in 1947—one for the Ruhr miners and the other for housing German employees in Frankfurt headquarters.

GREECE—In addition to considerable work on restoration of the important Corinth Canal, and general rehabilitation of the country's transport system, the American Mission for Aid to Greece (AMAG) has completed construction of an all-weather airport at Kozani, and has started other work at airports at Larissa, Salonika, Kavalla and Hassani and is surveying airport sites at Ioannina. Little construction beyond essential reconstruction is under way.

ITALY—Although major building materials are no longer in short supply, except for iron and cement, Italy's hoped for postwar construction boom has been delayed by what local observers believe is lack of private initiative. The uncertain political situation makes private investors doubtful of tying up large sums of money in such work. Only 150,000 dwelling rooms have been constructed since the end of the war—two-thirds

of that by state enterprise—and very little factory or other work has been done.

However, a brighter side is presented by the government's effort to re-establish its excellent highways and railroad system, latest reports showing that more than half of the huge reconstruction job is finished. Electrical production, too, under the stimulus of government effort had reached prewar levels, by the end of 1947 according to the Ministry of Public Works. In addition, the Ministry had prepared plans for construction of new hydro plants that are expected to double the Italian production within ten years.

IRELAND—Two hydro-electric projects in the northern part of Eire are now being pushed to supply increasing demands for electric energy. Built under the aegis of the Electricity Supply Board, the work is located on the 70-mile long River Erne, near the town of Ballyshannon on the coast of Donegal. The project will utilize a 140 ft. drop in the river level to produce an initial installed capacity of 75,000 kva. At present the country depends principally on steam power.

NETHERLANDS—Activity in Holland is still in the field of reconstruction of war damage, reclamation of flooded lands and industrialization of the country.

Although there are no construction projects of outstanding interest in progress, the main railroad and highway bridges have been repaired temporarily, and attention is now being turned to housing and work in the Netherlands Indies. The bulk of what construction is being done is in the industrialization program which includes large expansion of the petroleum industry and harbor reconstruction and shipyards.

POLAND—Facing an almost complete dislocation of its rail transport system, Poland has been working steadily over the past two years to rebuild that net work. Polish sources said that when the war ended, 10,000 miles of railroad track were completely destroyed, and only 30 locomotives, 100 passenger cars and 2,000 freight cars were left of all of the rolling stock on the railroad. More than half of the right-of-way damage has been repaired, and the rolling stock has been tripled. Additionally, the country has established more than 15,000 miles of national highways.

A great deal remains to be done, however, on river navigation though sections of the Oder and Vistula were cleared of sunken ships and wrecked bridges during 1946.

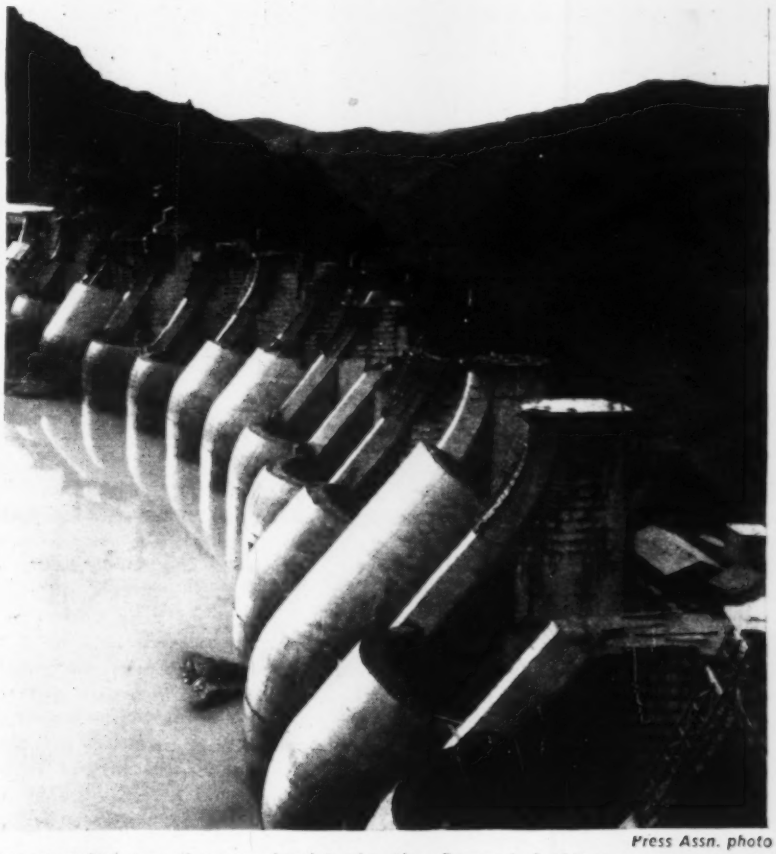
RUSSIA—All construction work in the Soviet Union is being carried forward under the new five-year plan (which expires in 1950) emphasizing restoration and further development of railways and heavy industry.

The government has announced as an objective the increasing of pig iron capacity by over 2,000,000 tons yearly, the raising of coal production to 36,000,000 tons, and the production of more than 2,000,000 kw. of electric power.

Major projects under way include the hydro-electric station at Mingechaur in the Caucasus Mountains; and the Lake Sevan hydro-power stations in Armenia; a group of auto plants at Kutaisi, Minsk, Dnepropetrovski; the major metallurgical plant near Leningrad; restoration of the oil, gas and shale industry in the Volga area and other works.

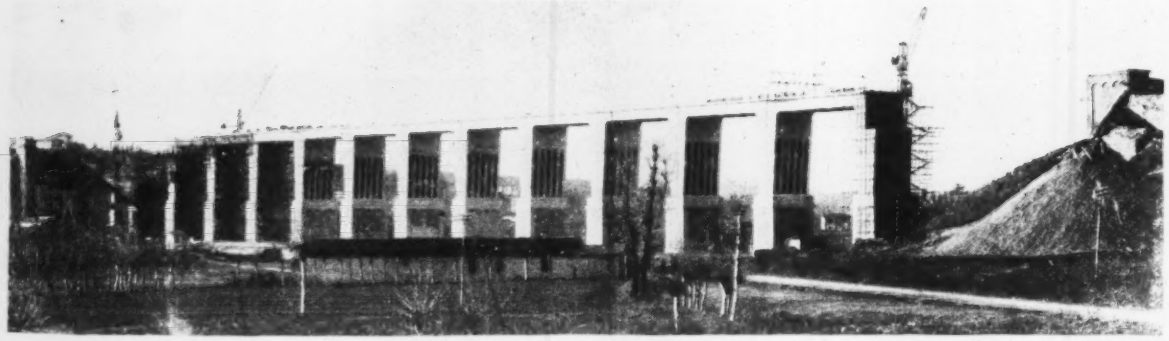
Only government agencies are involved in this work, and as a rule ministries supervise the work in their respective fields, the Academy of Sciences of the USSR supplying experts for exploratory expeditions.

SPAIN—Spain is concentrating on construction of hydro-electric projects, with the corollary of irrigation supplies. However, the biggest project completed in 1947 was a railroad between Cuenca and Utiel, cutting the distance from Madrid to Valencia by about 30 miles. A $16,000,000 project, the work included a half-mile long bridge over the Narboneta River with one arch of 200-ft. span.



Press Assn. photo

Nearly 6,000 feet above sea level in the Alps, France is building spectacular Lake Girotte Dam as part of its program to supplement hydro-power production. Located on the upper Isere River—a tributary of the Rhone—some 35 miles southeast of Geneva, Lake Girotte will supply supplemental storage for an already-completed power plant that will produce 60,000,000 kwh. annually.



Spectacular work like reconstruction of the viaduct at Desenzano on the Milan-Venice railroad features Italian construction.

The Spanish government has outlined a porgram for modification and improvement of the nation's ports to cost nearly $165,000,000 (at official exchange rates) and a larger sum for other works—particularly roads and bridges and new hydro projects—is expected to be included in new budget figures shortly. Almost all of the work is being done by private enterprise, with the government acting as supervisor or proprietor and doing little or no construction itself. American engineers have been in demand for work particularly on the electrification of the railways and construction of hydro plants.

SWITZERLAND—Switzerland during 1947 spent about 2½ billion Swiss francs for construction work, with power plants receiving the greatest emphasis, and the construction of office buildings, apartments and private housing next in that order. One other important project, still continuing, is the airport at Kloten, near Zurich.

The major hydro-power program that Switzerland inaugurated two years ago is progressing according to plan, the government said. Power plants under construction during the year were the Lucendro (completed); Plessur III (completed); Plons, Russein (completed); Julia, Wassen, Lavey, and Cleuson. Rossens Dam is nearly complete.

During the year large quantities of American construction equipment were imported for use on these projects.

SWEDEN—The total Swedish outlay for construction has dropped slightly under that of 1946, because of the shortage of iron and cement and other materials.

Hydro-electric developments have claimed nearly a quarter of all money spent for construction during the past year, the remainder going for industrial expansion and for housing—particularly housing built by private industrial firms for their workers.

Construction projects most needed and receiving top priority are power plants—mostly hydro-electric. These are in fact the only big projects either planned or likely to be put under way under the present tight monetary situation. Work on even such a comparatively important job as the new airport north of Stockholm is being kept to a minimum. Power stations planned and under construction will produce a total of about 600,000 kw., and the market is open for American construction machinery, although the question of dollars needed for such machinery is open to debate. Almost all the work is being done by private Swedish construction companies.

LATIN-AMERICAN SITUATION

ARGENTINA—With much of President Peron's five-year plan still in the planning and negotiation stage, probably the biggest construction project under way today is the new national airport at Buenos Aires. Now scheduled to be opened for service in May of this year, the airport will cost well over $70,000,000, including all buildings and a 16-mile superhighway to the center of the city. The biggest runway at the field will be 8,000 ft. in length, and capable of taking a 75,000-lb. wheel load. Hangars to be erected at the airport are to be concrete span structures and buildings will include a four-story administration building, two passenger reception centers, and a four-story hotel and a post office building.

The airport is the product of cooperation between Argentina engineers under Gen. Juan Pistarini, head of the Argentine Department of Public Works, and U. S. engineers who instructed the Argentines during a four months visit to the United States before drawing plans for the port.

BOLIVIA—Economic developments in Bolivia seem to have received a serious setback recently, when the Bolivian Development Corp. announced it had cancelled its contract with Compania McGraw-Warren, S. A., for construction of an all-weather highway connecting the cities of Cochabamba and Santa Cruz.

The company—a combination of Warren Bros. Co. of Cambridge, Mass., and the F. H. McGraw Co. of Hartford, Conn., was awarded a $9,500,000 contract for the 305-mi. road in 1945 (*ENR* July 26, 1945, vol. p. 83), and had completed grading about 100 kilometers of the route and putting down some of the base course for the macadam pavement. The development company made no official statement as to reasons for terminating the contract.

The road was a part of a comprehensive plan for economic development, which included improvement of transportation systems, development of the country's oil resources and provision of better marketing facilities. An $18,000,000 Export-Import Bank loan was to finance the highway and other work.

BRAZIL—Brazilian construction men looked at a seesaw year in 1947. An important setback during 1947 was suspension of work on the Paraiba valley hydroelectric project, where a Canadian-owned company that supplies light and power to Rio and Sao Paulo stopped work on the $150,000,000 project. An American construction company, Morrison-Knudsen, of Boise, Idaho, was at work on this job.

Several relatively small hydroelectric projects were finished or nearly finished as the year ended and public subscription had started for a company to establish a hydroelectric plant at Paulo Affonso Falls, intended to supply the power-short northeast section of the country. Mounting costs slowed construction of apartment houses and office buildings in the two big cities of the country, but many industries began or planned new factories.

CHILE—Two major construction objectives remain paramount in Chile—an accelerated hydro-electric program, and the gradual reconditioning of the country's highway system. Work is under way on the Sauzel power plant on the Cachapoal River, for which about $10,000,000 has been set aside, and other jobs on the Laja River are also in progress.

As to highways, the Department of Public Works spent a total of nearly $10,000,000 on road construction during 1947, and about $6,000,000 for bridge construction.

COLOMBIA—Two important hydroelectric projects are under way in Colombia—one known as the Rio Grande project in the Medellin industrial area—expected to produce some 250,000 kw. eventually; and the Anchicaya project in the central plateau. The Rio Grande project is a government-financed proposition, while the Anchicaya job is privately financed by a stock company known as Central Hydro Electica del Rio Anchicaya. A $5,000,000 project, the second job is at present about one-quarter financed. It will include a concrete arch dam 150 ft. high and about 520 ft. long with an installed capacity of 88,000 kw.

Other projects include a proposal to build 870 miles of new railroad to bridge the final gap in a 1,400-mile direct rail link between Bogota, the Colombia capital, and the Port of Concha on the southern end of Lake Maracaibo in Venezuela. Sections of the new line have been surveyed, but no other work done at present.

The four-story administration building takes shape outside Buenos Aires, Argentina, as work is pushed toward May opening of the $70,000,000 Ezeiza Airport. As big as Idlewild airfield in New York City, two of the three runways will be 7,500 and 8,000 ft. long, capable of handling biggest transport planes now in use.

CUBA—Despite an increase in construction costs approximating 100 percent over prewar figures, low labor productivity limited supply of skilled workmen, and slow deliveries of U. S.-made construction equipment, Cuba is pushing ahead a number of projects involving large expenditures.

Biggest public improvement program is concentrated in the Havana area, including divided highways to relieve traffic jams, schools construction, a federally-financed housing project and a major water supply program.

Outside the capital area, extensive new highway construction is under way, including resurfacing of a large part of the central highway, bisecting the entire island. Other work involves the construction of a new water supply for the city of Santa Clara and a considerable enlargement of Santa Clara's sewage treatment plant.

DOMINICAN REPUBLIC—The Dominican Republic is rapidly pushing ahead a substantial program of public works, including construction of roads and bridges, irrigation canals and public buildings. Although much work has been done on increasing highway communications into and around Ciudad Trujillo, the capital, twelve new highways, totalling some 400 miles, are yet to be completed.

EL SALVADOR—The Lempa River hydro-electric development, a $14,000,000 project whose planning is under contract to the Harza Engineering Co. of Chicago, is the principal work now being prepared. Other major works planned or under way include a 600 ft. suspension bridge across the Lempa River at San Marcos, on which bids have been asked by March 5 of this year and a new airport administration and service building at San Salvador and a superhighway to connect the airport with the downtown area of the city.

MEXICO—Mexico's 14-year private building construction boom that started in 1934 and hit an astonishing pace during wartime now seems to have been definitely broken.

Investors are reported shying away from construction. One indicator is an announcement that in the federal district (Mexico City) only about 20 percent of 10,000 bricklayers are working and most of these are employed on public works.

Meanwhile, the government has pushed ahead an ambitious program to expand irrigation and produce water power throughout the country at sites already fixed.

PANAMA—With a $25,000,000 loan approved by the Export-Import

Bank, the Republic of Panama is now planning to complete its section of the International Highway between Rio Hato and the Costa Rican border. Some of the money will be used for a system of secondary and feeder roads to this main artery.

PUERTO RICO—Major construction projects now under way in Puerto Rico are a vast housing and vocational schools construction program and some hydro-electric plants and water supply projects.

Permits for private construction, estimated to total $22,000,000, were authorized by December of 1947. Current construction by the insular government is valued at about $102,000,000, while a six-year public improvement program costing $65,000,000, has been recommended by the island's planning board.

PERU—The major hydro-electric project under way in Peru during the year was a project on the canyon of the Cato River, 60 miles northeast of Chimbote. This project, to produce 125,000 kw. of power, is a part of a vast industrialization project in the Chimbote area. A spectacular job, it will make use of a drop of about 1,400 ft. in a six-mile stretch of river below a catchment area of 110 sq. miles. Other projects under way in the country include a five-year highway construction program expected to cost over $50,000,000—at least $10,000,000 of which will be used to buy roadbuilding equipment from the United States. The program envisages increasing the country's existing 20,000-mile highway network by about 3,000 miles.

VENEZUELA—Venezuelan construction men have been so active during the past year that it is difficult to pick out specific projects. However, principal work seems to be a 200-mile, $9,000,000 highway through the states of Guarico and Angoatetui, to connect the town of El Sombrero to the port of Guanta on the Caribbean Sea. This highway is financed by a group of oil companies but will be opened to public use. Other work includes a major port improvement program involving expenditure of about $60,000,000, new water systems for the capital city of Caracas, and similar projects in many other cities.

THE EAST AND OTHER AREAS

AFGHANISTAN—A $17,000,000 construction program to permit irrigation of large areas and provide extensive mileage of all-weather highways has been started by the American construction firm of Morrison-Knudson, Inc., following lengthy preparations. Other construction being planned, according to M. K. Ludin, Afghanistan minister of public works, includes plants for a tremendous increase in the country's hydro-electric facilities. Installations now total only about 10,000 kw.

AUSTRALIA—Shortage of manpower, equipment and construction materials held up beginning of major projects in Australia, excepting the raising of Mundaring Weir, in Western Australia. Work on the new Eildon Dam, in Victoria, is not likely to get under way in 1948, and the spectacular Snowy River diversion scheme is still in the exporatory stage.

The only other important project completed during the year is the Stirling Dam in western Australia, now Australia's highest structure. The Clarke hydro dam on the Derwent River in Tasmania is nearing completion, and the Tarraleah dam, also in Tasmania, is scheduled for completion by March. Construction has been speeded with the aid of Polish immigrant manpower and U. S. Army surplus equipment.

INDIA—Food and power are India's greatest needs and therefore multiple-purpose irrigation and hydro-electric projects lead the list claiming construction priorities. With very few exceptions, however, there is little actual work in progress, nor is there any immediate prospect of an all-out start of construction. Hampered by severe shortages of both steel and cement, India can barely meet her current construction requirements.

Every state and province has a long list of postwar plans, but civil unrest, partition of the country, and lack of construction materials have stalled them. The question of financing is of major importance.

IRAQ—The Iraq government is now carrying out extensive flood control projects including a $12,000,000 control reservoir on the Euphrates River; the construction of Bekhma Dam across the Greater Zab River, the dam to have a maximum height of more than 100 ft. to control the water level of the Tigris River at Baghdad at a cost of about $20,000,000. The state railways are already pushing projects for which $40,000,000 is available.

JAPAN—Japan today looks like one large building project. The people and their construction engineers are struggling to replace the 3,000,000 buildings—more than 2,000,000 of them dwellings—which were destroyed during the war, and since August 1945 have succeeded in putting up about 640,000 dwelling houses and 138,000 other structures. Some of the structures built include restaurants, tea houses and hotels which were admittedly not needed but which proved to be profitable.

PHILIPPINE REPUBLIC—Faced, like European countries, with a major task of reconstruction, the Philippine government has nevertheless embarked on a $100,000,000 program for road construction. The U. S. Public Roads Administration, assisting the republic, has set up a district office to aid in initial work. Among other projects being carried out by the government is the rehabilitation at a cost of about $7,500,000 of old Nielson Field on the outskirts of Manila, to make it a base for international air transport in the Orient.

SOUTH AFRICA—With about $168,000,000 involved, South Africa is now planning development of two ambitious schemes. Foremost of these is the Kariba Gorge project—a $92,000,000 project. Second project is a plan for the Orange River in the Orange Free State, requiring expenditure of $72,000,000, and irrigation of more than 100,000 acres of land.

The Kariba Gorge project would involve the diversion of the Zambesi River with a 300-ft. high dam across Kariba Gorge, to impound about 40,000,000-acre-ft. of water, and produce about 330,000 hp. of electricity.

John Hancock Mutual Life Insurance Co. photo

John Hancock Village near Boston is an example of equity investment in rental housing by insurance companies.

Perspective on Housing

***Contents in Brief**—Many obstacles must be hurdled before greater progress in urban redevelopment and mass housing may be realized. These include barriers to lower construction costs, to efficient use of land, to technological improvement, to better management, to more productive labor, to more flexible legal regulation, to easier financing, to reduction of home-ownership risks, to more rental housing and to better marketing methods. Recently, many suggestions for eliminating them have been proposed, some of which are worthy of consideration.*

HOUSING is no new problem. For a half century, the relationship between supply and demand has been deteriorating. Thus, the blame for today's shortages cannot be placed entirely on the last war and the preceding depression. Consequently, the solution to the problem can be found only in removing the basic causes, which existed even in so-called normal times.

Remedying the housing headache can be a very lucrative enterprise. As much as $75,000,000,000—mostly private investment—could be employed profitably in the redevelopment of urban areas during the next decade. This was the conclusion reached by the President in his economic report to Congress, January, 1948. Also, he pointed out, that only a small minority of families at present can afford to purchase new houses of satisfactory size and quality. If the mass market can be tapped, the returns should be high.

For many years, housing has been inadequate in quality and quantity and too high in price. As the standard of living in the United States rose during the 20th century, and as communities grew in size, housing needs became more difficult to satisfy and provision of shelter more costly. While other industries increased output considerably and reduced the effort needed per unit, house builders did not make comparable advances in capacity or productivity.

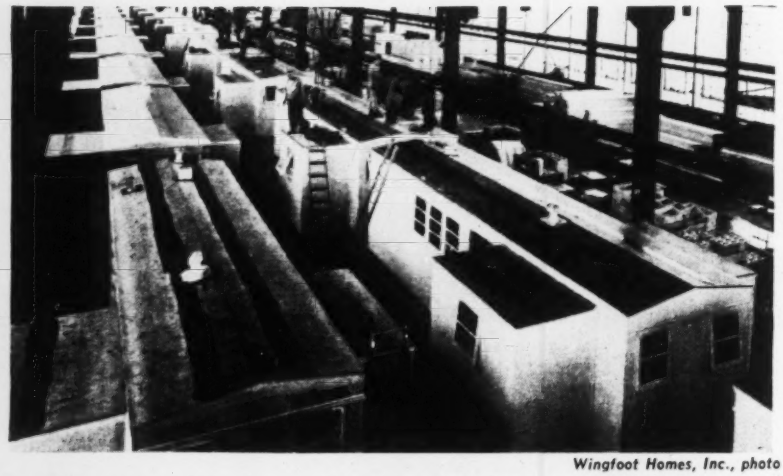
Housing production fluctuates

As with other industries, housebuilding activity was relatively high when economic conditions were good and low when they were bad. But, in contrast to the reaction of prices in other industries during these periods, the price of housing rose rapidly, but declined very slowly.

Following World War I, housing costs jumped sharply with increased production, and in the subsequent period of general decline, they also dropped, but not to a level that could be termed low. Later, as incomes rose, a period of great construction activity began, reaching a peak in 1925, when 937,000 new residential units were built in non-farm areas. But it appears now that the prices of these homes were much too high to permit sustained production, for the annual rate decreased thereafter. In 1933, a low was reached, and only 93,000 units were erected.

During the depression, house building recovered slowly and, at the outbreak of World War II, reached an annual rate of 715,000, with the start of a billion-dollar defense housing program. In the war period, emphasis was placed on temporary housing, with restrictions on other types. When the war was over, there naturally was a great demand for housing. "We need an average of more than a million new urban dwelling units a year for the next ten years," said the President in his economic report. "The needs of rural areas are also great."

While 1947, with 334,000 perma-



Wingfoot Homes, Inc., photo

Complete factory prefabrication of dwellings is viewed by some authorities as the solution to the housing problem.

American Houses, Inc., (Morgan) photo

Field erection of houses using pre-assembled components is another method of reducing costs and speeding construction.

nent units completed, was second only to 1925 in house production, there has been no general improvement in the supply-demand relationship. It is clearly apparent that most of the housing is being built for families in the higher income brackets, according to the President, and when families of low and middle income purchase new homes, the high cost places an excessive financial strain upon them. The price of housing has been getting farther and farther out of line with incomes, he believes.

Although it is evident that home builders alone are not at fault and that, if pursued far enough, housing will be found to touch upon nearly every sore spot in the nation's economic and social structure, builders have nevertheless drawn most of the fire of critics. The reason is not hard to find: The most promising possibilities for reducing the overall cost of housing lie in lowering construction costs.

On the other hand, while it may be true that the greatest contribution to cost reduction may be made by builders, the effect of price reductions in any one phase of housing may be far from negligible. As pointed out in a report by the housing committee of the National Association of Manufacturers, a part of the high cost of housing may be attributed to a certain prevalent philosophy: No single activity has a very large effect on the final price of the completed structure and therefore, the total cost is not affected appreciably by the price policy of any component.

This attitude may account for the long-run increase in building costs, despite cyclical fluctuations. It may also help explain why the decline in each successive depression did not reach the low point of the preceding one. Following this line of reasoning, before really substantial price reductions can be obtained, the charge for each contributory element must be scaled down. An examination of the factors that influence housing costs may indicate means for achieving this result.

Nature of housing industry

House-building processes are dispersed among seven functional divisions—the builder or general contractor, the special trade contractors, labor, the architect and engineer, the land subdivider, materials producers and distributors, and government and underwriters.

With respect to the effect of their activities on costs, the housing committee of the 20th Century Fund reports, "Each of the first six functional groups (and sometimes the seventh as well) naturally tries to obtain the greatest possible remuneration for its services. Each tends, especially in the larger cities, to establish rules and enter into price-fixing and other combinations in restraint of trade for the protection of its economic interests. In the absence of dependable and responsible management, the use of such tactics has enabled each group to perpetuate its established, quasi-independent position in the industry. As a result, a strong management is prevented, technical advancement is hindered, and the industry is frozen in its traditional mold. The industry is thus left committed to unnecessarily costly methods of producing an unnecessarily costly product."

Various financial institutions occupy a dominant position in the industry and exert power in several ways. Fearful of impairing the security of existing mortgages on

high-cost property, they may limit loans for low-price houses and favor more expensive construction. They may influence the volume of construction through control of credit and may direct production into houses for owner occupancy or rent. And they may control such details as location of dwellings, arrangement, architectural style, materials and character of construction. On the legal side, too, procedures are costly and time-consuming and fees are regarded generally as exorbitant and sometimes unnecessary.

Government in the housing field

Government has intervened in housing in several ways, but its efforts have been halting and frequently inept. State and federal anti-trust laws, where they exist, have not been effectively administered to maintain competitive conditions. Regulation of housing through building codes frequently adds to housing costs more than necessary to protect the essential public interests. Zoning regulations often tend toward excessive allowance for commercial or high-density use, thereby increasing land costs, and where there are no zoning regulations, there is no barrier to undesirable intermingling of housing and other uses.

Activities of the federal government in the housing field began during World War I and have subsequently continued as emergency measures. The wave of foreclosures between 1931 and 1933 led to the creation of the Home Owners Loan Corp., to take over distress mortgages on non-farm housing. The Federal Housing Administration was set up in 1934 primarily as a recovery measure, but has since become better known through its provisions for federal insurance of private credit. Its mortgage system is supplementary to and often competitive with the Federal Home Loan Bank System, which had been formed in 1932, largely of savings and loan associations, to provide reserve credit facilities for urban residential mortgage institutions. The two agencies have acted to make home ownership easier and cheaper, but they have not reduced the risks to the individual.

An emergency aspect was also present when the federal government entered the rental housing field in 1933 with a program launched under the Public Works Administration. The purpose was to increase construction volume, as much as to meet the needs of low-income families.

New York City Housing Authority photo

John Lovejoy Elliott Houses illustrate one solution to the problem of providing adequate shelter for low-income families. New York City makes annual contributions to keep rent low.

Low-rent housing subsidized

As an aftermath, passage of the U. S. Housing Act of 1937 followed, establishing the public-housing function on a permanent basis in the U. S. Housing Authority (now incorporated in the Federal Public Housing Authority of the Housing and Home Finance Agency). Also, under this act, loans to local public housing agencies were authorized up to 90 percent of the capital cost of a project, to be amortized in not more than 60 years and to pay interest at the going federal rate plus ½ percent. To insure low rents, construction costs were limited, and subsidies in the form of annual contributions and capital grants were provided. Eligibility of tenants is determined by income.

Best progress in subsidized low-cost housing has been made in New York City where, with state aid, the municipal housing authority has 14 projects, totaling 17,017 apartments, in operation and 16 more, providing 20,776 apartments, under construction or early schedule. General excellence in design and a construction cost per room during the past two years that has not exceeded $2,273 a room and that has been as low as $1,523 characterize this housing.

By 1940, over 10 percent of new dwelling units in the nation were being built under public auspices, and later, under war conditions, public housing became an even more important factor in the housing picture.

In contrast to public housing, a trend has been initiated toward a form of subsidized private housing in which an equity investment in urban redevelopment projects has been taken by insurance companies. This has been brought about by state laws recently enacted. In New York State, for example, under the Urban Redevelopment Companies Act of 1942 and 1943, seven developments now under construction will, upon completion, provide housing for 13,851 families. Under this law, the power of eminent domain is exercised on behalf of special redevelopment corporations, and taxes are limited for a period of 25 years to those before rehabilitation. However, corporate dividends are limited and operations are subject to state regulation.

A New York State law of 1945

also permitted savings banks to form corporations to build and own housing projects. But with a maximum placed on rents and size of developments, rising construction costs have caused the banks to shelve any present plans in this field.

Postwar trends

After the last war, the federal government attempted to encourage housing by providing priorities to builders for supplies, premium payments for production of critical materials, guaranteed markets for factory-built dwellings, loans to prefabricators and building materials manufacturers, insured mortgages, war surplus supplies, limits on non-residential construction, increased importation of building materials and restrictions on exporting of critical items. These stimulii were withdrawn in 1947.

Also, in 1947, further consolidation of federal non-farm housing operations was effected through the creation of the Housing and Home Finance Agency. The new organization is composed of the Home Loan Bank Board, the Federal Housing Administration, the Public Housing Administration and a coordinating commission.

The preceding summarizes the major factors affecting costs. The question remains as to what to do about them. Toward this end, many proposals have been made in recent years. Included among the more significant of these are the recommendations of the housing committee of the 20th Century Fund ("American Housing," 1944). This group urged:

1. Land utilization—control of the price of land for housing through an extension of the public regulation of land use, stringent regulation of speculative subdividing, rationalization of zoning, development of assessment policies based on the realities of the future uses of inlying areas, and the improvement of facilities for reassembling small ownerships in blighted areas.

2. Industrial reorganization—reduction of production costs through encouragement of larger producing organizations, greater use of machinery and factory-produced parts, more highly productive industrial techniques, and the establishment, for the bulk of house production, of more direct and economical methods of materials distribution. Also, that the anti-trust laws be more vigorously enforced, that building codes be revised to the performance-standards type, and that the federal government amplify its facilities for technical research and publish critical information concerning the housing market.

3. Investment and financing—reduction of market costs through the greater integration of the production and marketing function, the simplification of transfer procedure, the encouragement of larger-scale owning and operating organizations in the rental field; reduction of financing costs through the simplification of mortgage procedures or the creation of other less cumbersome methods of long-term finance; and development of a more unified and efficient house-financing system.

4. Public housing—recognition of the necessity of utilizing various forms of public activity and public aid in a comprehensive attack on the housing problem and necessary provision for such utilization; but that public activity be designed, so far as possible, to the end of reduced costs and more efficient forms of industrial operation. More specifically, with respect to public housing projects, that responsibility for action be placed on local housing authorities, that subsidies be set as a proportion of the economic rent of each housing development and that the subsidy for a given dwelling unit within a project be graded according to the paying capacity of the family occupying that unit.

5. Maintenance and operation—reduction of the costs of operating dwellings through the simplification of structures and the improvement of their quality, better balance of the durability of parts, acceptance of regularized policies of debt and investment amortization, encouragement of better methods of and organizations for property maintenance, and the establishment of means for eliminating outworn and outmoded buildings.

Senators propose remedies

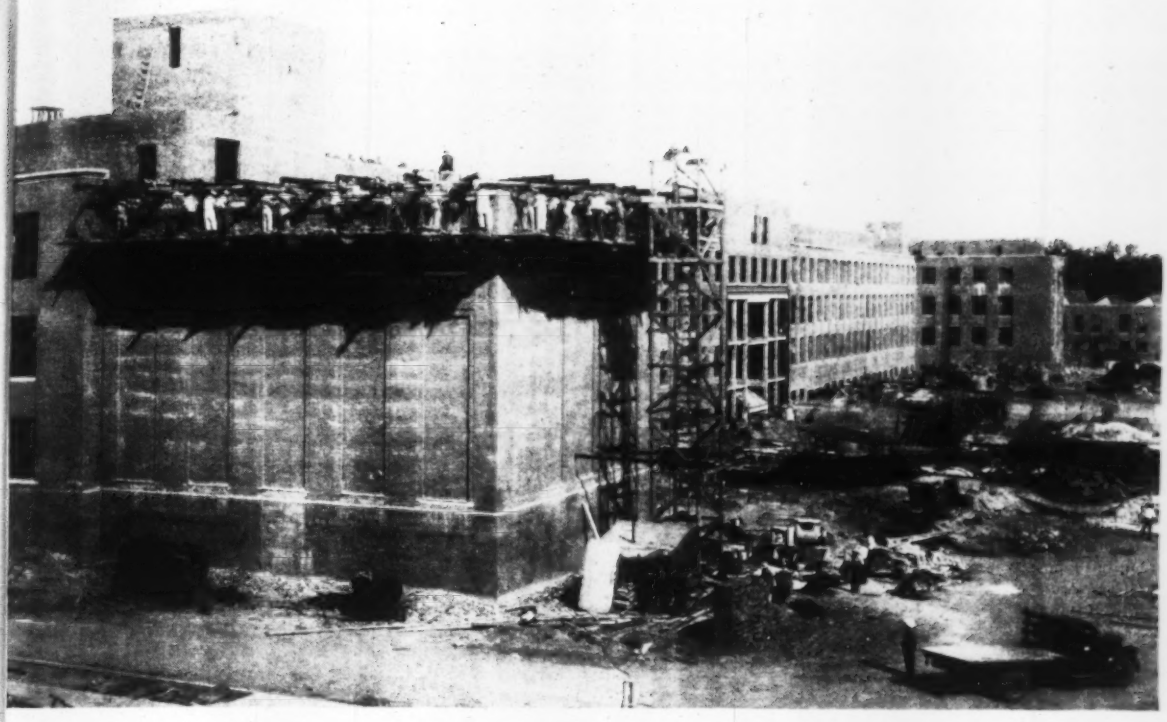
Similarly, after an investigation of the industry, Senator Flanders recommended to the joint congressional committee on housing in January that the industry needs to be reorganized along modern industrial lines. He urged that every effort be made to standardize building components and promote modular coordination. And he further proposed that the facilities of the Bureau of Standards be expanded to integrate research and testing facilities, as well as to encourage new methods of production and the use of satisfactory new materials.

The senator also believes that the National Housing Act should be amended to provide government aid for financing planning, plant and equipment, and working capital for large-scale projects. Also, he contends that section 609 of the act, which provides for the insurance of loans to housing manufacturers, scheduled to expire in March, 1948, should be extended in time, enlarged in scope and administered more expeditiously. To help clear the way for modernization of the industry, he urges promotion of a national model building code and prosecution of those who engage in restraint of trade.

New housing legislation

A long-range attack on the housing problem is also contemplated in the National Housing Commission Bill (S. 866), sponsored by Senators Taft, Ellender and Wagner, and recently approved by the Senate Banking Committee. This measure would establish a permanent federal housing commission. During the first year of the program, it would provide $33,000,000 mostly for subsidies to low-rent public housing, and at the end of four years would increase this sum to between $100,000,000 and $150,000,000 annually. It would also extend aid to local groups for the development of blighted areas through loans and annual contributions. Finally, under this bill, the new housing agency would be authorized to engage in technical research and provide advice and guidance to communities for local housing studies, surveys and planning.

Without waiting for legislative help, however, several large construction companies have already entered the housing field with considerable success. If their experiences may be considered typical of what the industry can do, other contractors may be expected to follow suit.



Administration and laboratory building, 300 x 600 ft., part of $15,000,000 naval research center at White Oak, Md

INVENTORY OF MAJOR PROJECTS

Reviews of projects currently in the headlines with information on costs, sizes and features

BUILDING AND HOUSING

ALUMINUM COMPANY OF AMERICA—A $100,000,000 building and modernization program, began late in 1946, is now nearing completion. Largest of the plants under construction is the Davenport Works at Bettendorf, Iowa, which will provide 43 acres of floor space. A new die-casting works at Hillside, Ill., slated to begin operations early this summer, occupies about 32 acres of a 54-acre plot.

CATERPILLAR TRACTOR CO.—An expansion program now estimated to cost $13,000,000 is adding 50-odd acres of floor space to the manufacturing plant at Peoria, Ill., an increase of more than 60 percent. At present under construction is an 850,000-sq. ft. factory for sheet metal and steel fabrication, assembly of diesel-driven tractors and motor graders and final assembly of certain earthmoving equipment in the company's line. Another large building, the diesel engine factory—925,000 sq. ft.—has been placed in partial operation, although some construction work is still to be done.

AMERICAN CYANAMID CO.—Manufacturing operations started in November at the Calco Chemical Division Willow Island works near Parkersburg, W. Va. Four 60x580-ft. buildings, two and three stories high, for producing pharmaceuticals, plastic molding materials and inorganic pigments, a power house and a warehouse are being completed at a cost of about $20,000,000.

CELANESE CORPORATION OF AMERICA—The $40,000,000 plant at Rock Hill, S. C., consisting of nine buildings, is expected to begin operation in the third quarter of 1948. Steelwork is under way on the textile mill and the boiler house and has been completed on the spinning building.

CORN PRODUCTS REFINING CO.—Costing over 10,000,000, the new processing plant at Corpus Christi, Texas, for manufacturing starch, sugar and high-protein livestock feeds from milo maize is expected to be ready for the 1948 harvest. One unit of 28 silos (52 silos planned) with a total capacity of 2,000,000 bbl. was finished in October.

FORD MOTOR CO.—Three new assembly plants will be in production in 1948. At Metuchen, N. J., 629,400 sq. ft., of floor construction is 60 percent complete; at St. Louis, Mo., 957,400 sq. ft., 75 percent is complete; and at Hapeville, Ga., 657,600 sq. ft., 85 percent is complete.

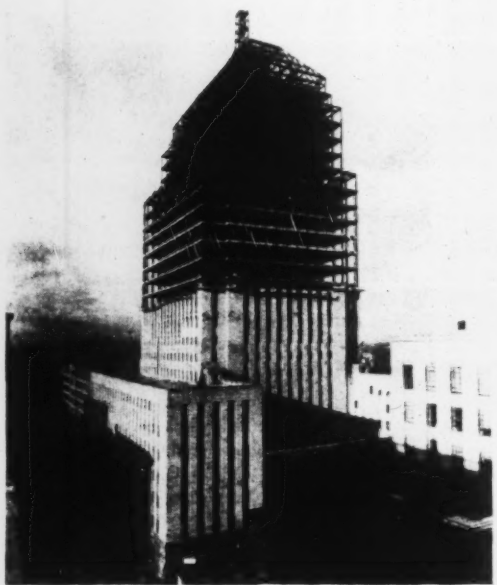
GENERAL ELECTRIC CO.—A large-scale expansion program, contemplating

Turner Construction Co. photo

Federal Telephone and Radio Corp.—More than 630,000 sq.ft. of floor is provided in the new 2-story building at Clifton, N. J., part of $7,000,000 expansion program recently completed.

The Austin Co. photo

Sinclair Refining Co.—Two of the larger units in a nine-building $4,000,000 research and development group at Harvey, Ill.



Turner Construction Co. photo

John Hancock Mutual Life Insurance Co.—The 26-story addition to the Boston home office will be ready for occupancy in 1949.

the expenditure of about $300,000,000, is under way. Largest of the projects is Electronics Park, a $25,000,000 research, engineering and manufacturing center near Syracuse, N. Y., which was recently put in operation. At Schenectady, a $20,000,000 factory with about 19 acres of floor space, for the manufacture of steam turbines and electric generators, is expected to be completed late in 1949. An $8,000,000 research laboratory at The Knolls on the Mohawk River, near Schenectady, may be opened shortly. And in addition to its own expanded research facilities, G.E. will operate for the Atomic Energy Commission a $20,000,000 atomic-power laboratory at The Knolls, expected to be finished in 1949.

GENERAL MOTORS CORP.—Among the larger projects of the various divisions are: Buick Motor—a new sheet metal plant at Flint, Mich., with 753,000 sq. ft. of floor, completed in December. Chevrolet Motor jointly with Fisher Body—an assembly plant near Flint, Mich., with 10 buildings having 1,269,000 sq. ft., started operations in June and another in Van Nuys, Calif., with 8 buildings, 915,000 sq. ft., commenced production in December. Fisher Body—fabricating unit at Hamilton, Ohio, with 1,200,000 sq. ft. and a body hardware factory at Columbus, Ohio, with 10,000,000 sq. ft. New Departure—one-story factory, U-shaped, roughly 900x1,040 ft., at Sandusky, Ohio, finished in 1947. Buick-Old-mobile-Pontiac—limited production has started in the assembly plants at Atlanta, Ga., with 993,000 sq. ft., and Wilmington, Del., with 1,253,500 sq. ft.; the Framingham, Mass., plant, with 201,400 sq. ft. is expected to be in operation in March.

LOUISVILLE TIMES—A new plant at Louisville, Ky., shared with the Courier-Journal, Standard Gravure Corp. and radio station WHAS, consists of two units giving the appearance of one building. The 4-story and basement section of flat-slab concrete construction, housing presses and mechanical equipment, is segregated structurally from the 7-story steel-frame office section to prevent vibration transmission. Faced with limestone and granite, the building, which is expected to be entirely completed this summer, provides 323,000 sq. ft. of floor.

PHILADELPHIA INQUIRER—Claimed to be the largest rotagravure printing plant in the world, the new building for the division of Triangle Publications, Inc., in Philadelphia, Pa. is now 80 percent complete. In addition to the 720,000 sq. ft. of floor area it provides, the development also includes a helicopter landing base, broadcasting and television towers on the existing building, garage facilities for a truck fleet and a tank farm for solvent recovery processing.

SAN FRANCISCO NAVAL SHIPYARD—The $3,000,000 glass-walled ordnance building is 80 percent complete and the $1 million boiler plant, 60 percent complete. The 450-ton crane is finished, but final testing awaits completion of two 1,400-ft. berthing piers now 50 percent complete, being built at a cost of $3,000,000. All major construction at the yard is expected to be finished by July 1.

SUNSHINE BISCUITS, INC.—The largest ovens in the world will be housed in an air-conditioned bakery and candy manufacturing plant being built at Kansas City, Mo. The steel-frame structure is 1,200 ft. long, with a basement under the full length and a 5-story section in the center, and provides about 800,000 sq. ft. of floor. It is supported on a foundation designed as an inverted two-way reinforced concrete flat slab, into which a steel grillage is incorporated.

WESTINGHOUSE ELECTRIC CORP.—In the program for building district manufacturing and repair shops with companion warehouses, the one at St. Louis, Mo., was completed last June; that at Houston, Texas, was finished in December; those at Hillside, N. J., and Philadelphia, Pa., will be ready for occupancy in February;

Geo. A. Fuller Co. photo

Caribe-Hilton Hotel—To be ready for the winter of 1948-49, this 300-room, 12-story structure in Puerto Rico will cost $6,000,000.

Prudential Insurance Co.—This 10-story office building in Los Angeles, Calif., is scheduled for fall completion.

the job at Chicago started at the end of 1947 and plans for the Cincinnati project were completed in December.

THE TEXAS COMPANY—Part of what probably will be one of the largest gasoline refineries in the East, the 40,000-bbl. per day vacuum distillation unit and fluid catalytic cracking unit at Eagle Point, N. J., will be completed in 1949. Estimates of cost run in the neighborhood of $30,000,000. Construction is also under way on a waterfront terminal at the foot of Gasconade St. in south St. Louis, one of a network of key distribution points on inland waterways. Facilities will include 8 tanks with a total capacity of 150,000 bbl., offices, garages and repair shops.

AMERICAN ENKA CORP.—The $25,000,000 rayon-yarn plant at Lowland, Tenn., to produce about 22,000,000 lb. of yarn annually, is expected to be completed by mid-1948. Steel has been erected for the chemicals and spinning buildings and the power house. The chemical stores and pulp storage structures were finished late in 1947.

BROOKHAVEN NATIONAL LABORATORY—Expected to be completed in the fall, at a cost of $10,000,000, this joint project of the U. S. Atomic Energy Commission and Associated Universities, Inc., will be used for fundamental research in beneficial uses of atomic energy.

ILLINOIS BELL TELEPHONE CO.—To relieve overloaded long distance facilities, $10,000,000 of work centering in a new air-conditioned building is being erected in Chicago. Eleven stories in height, with a ground area of 16,450 sq. ft., the structure now 80 percent complete, has a steel frame resting on 54 caissons sunk about 100 ft. to bedrock.

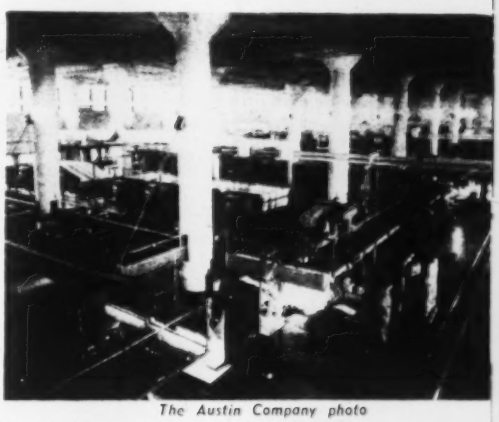
JOHNS-MANVILLE CORP.—The research center, near Manville, N. J., will ultimately consist of several buildings on a 93-acre site. Of these, the 2-story high, 136x575-ft. wet-processes factory-laboratory, the water-supply and purification plant and the waste-disposal plant station have been completed. The 3-story high, 67x356-ft. main research unit and the mechanical and engineering buildings, still under construction, are expected to be occupied by July. The dry-processes factory-laboratory has not yet reached the construction stage.

PORT OF NEW YORK AUTHORITY—Construction is under way on a $7,200,000 motor truck terminal in New York City and a $4,600,000 terminal in Newark, N. J. Expected to be completed late in 1948, the former, capable of handling 2,000 tons daily, is 1,000 ft. long by 60 ft. wide, with an 80x800-ft. long freight platform equipped with an overhead chain conveyor and bays for 144 trucks. The 2,500-ton capacity, 200x1,150-ft. Newark structure, which may be finished early in 1949, has a 100x1,000-ft. freight platform and 160 truck bays.

ESSO BUILDING—The all-air-conditioned, 33-story addition to Rockefeller Center in New York for the Standard Oil Co. of New Jersey is partly occupied. Containing 350,000 sq. ft. of rentable area, the $7,000,000 structure has a central tower 90 ft. wide by 127 ft. deep that will rise without setbacks to a height of 424 ft.

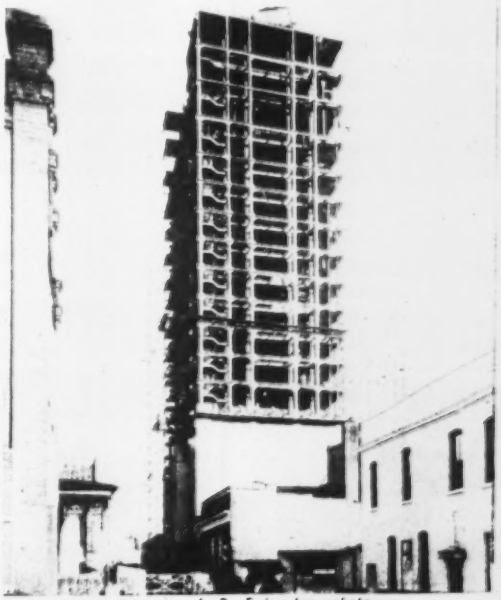
UNITED NATIONS HEADQUARTERS—While construction awaits a $65,000,000 interest-free loan from the United States, costs have increased and plans are being changed. It is now contemplated that a 7-story concrete building at the south end of the 17-acre site on the East River in New York City will be salvaged for use as a library. Also under study are other economies in the original design, which called for a 45-story secretariat building, a fan-shaped general assembly hall, garages, a 600-seat theater and other structures for serving the staff. New York City may spend $15,000,000 for improving adjacent areas.

TERRACE PLAZA HOTEL—Completion



The Austin Company photo

Crowell Collier Publishing Co.—Reinforced concrete press building at Springfield, Ohio.

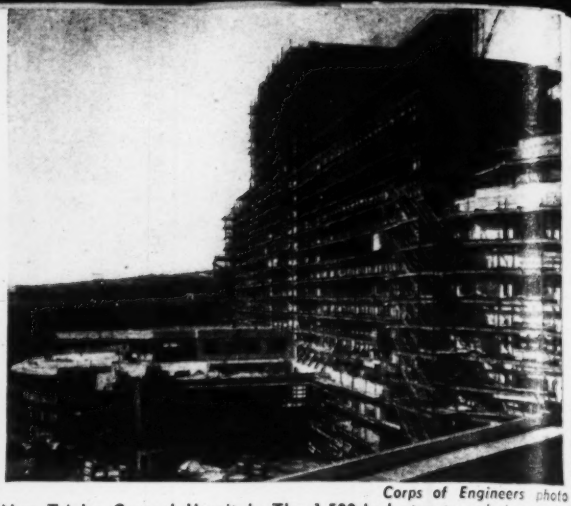


J. P. Ewin, Inc. photo

Waterman Steamship Corp.—$3,000,000 18-story office building in Mobile, Ala.

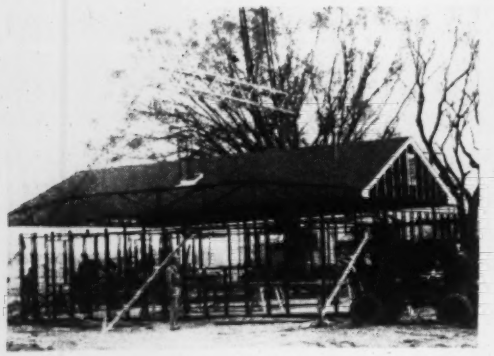
Geo. A. Fuller Co. photo

New York Life Insurance Co.—Fresh Meadow project in Queens, N. Y,. includes two 13-story buildings with 600 apartments.



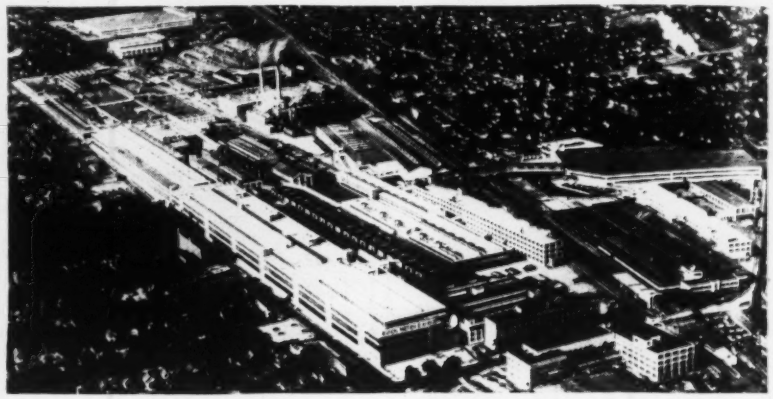
Corps of Engineers photo

New Tripler General Hospital—The 1,500-bed structure being built for the Army on Oahu Island, Hawaii, will be finished this year.



Byrne-Moline Communities, Inc., photo

Molette Houses—Pre-assembly makes possible June completion of a $4,000,000 project consisting of 511 dwellings at Moline, Ill.



Buick Motors—Recently completed, 17 buildings added 2,000,000 sq. ft. of floor at Flint, Mich. Largest is the 1,536-ft. long structure in left foreground.

Tishman Realty & Construction Co. photo

Park Ave. Office Building—New York City's first postwar office building to be completed.

this summer is predicted for the $12,000,000 air-conditioned 20-story combined hotel and department-store building in Cincinnati, Ohio. From the second to the eighth floor, the structure is windowless, being devoted to commercial activities. The hotel lobby is on the eighth floor.

CIVIL AERONAUTICS ADMINISTRATION—Five hangars going up at the National Airport, Washington, D. C., costing $4,400,000, comprise the largest hangar project now under construction. In four of these, the floors are 126 x 280 ft., exclusive of the two-story offices and shops at the sides and rear of the structures. Principal roof framing consists of steel trusses of 280-ft. span on 17-ft. centers. The fifth hangar is somewhat smaller, the hangar area measuring 174 x 240 ft. and the overall dimension being 214 x 283 ft.

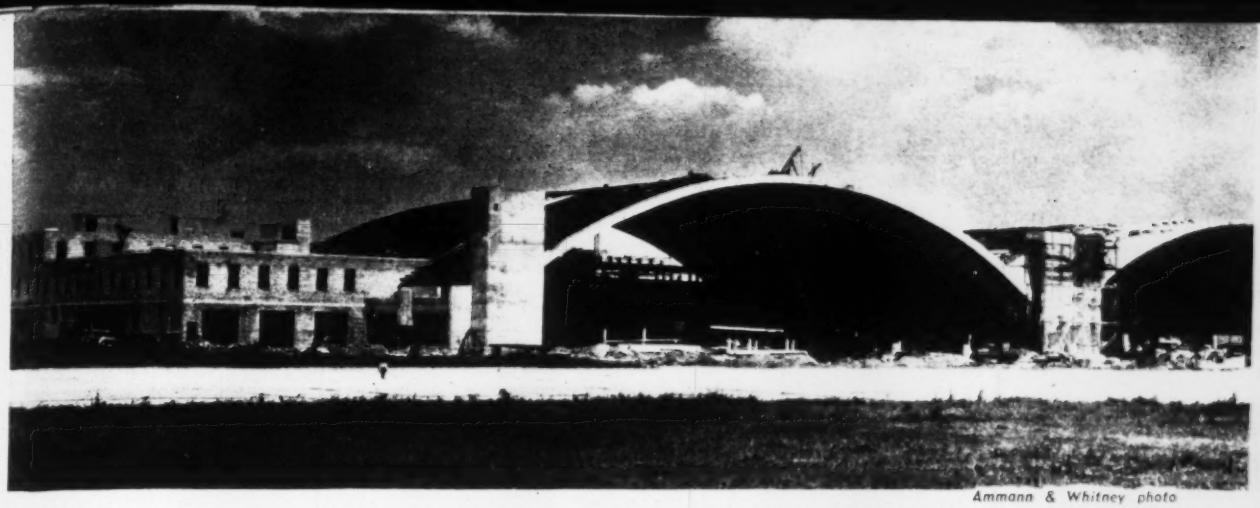
VETERANS ADMINISTRATION—Construction has started under the supervision of the Corps of Engineers on the following hospitals: Peekskill, N. Y., 2,000 beds; Albany, Buffalo and Brooklyn, N. Y., 1,000 beds each; Shreveport, La., 450 beds; Providence, R. I., 400 beds; Sioux Falls, S. D., 300 beds; Fresno, Calif., 250 beds; and Minot, N. D., and Grand Junction, Colo., 150 beds each. These are the initial jobs in a $1,125,000,000 program.

TEXAS MEDICAL CENTER—At Houston, over $9,000,000 of construction is under way of a planned $100,000,000, which will include at least 12 hospitals, four universities and several research institutions. At present, the $3,500,000 Baylor University College of Medicine is about completed. The 14-story, $2,000,000 Hermann Professional Building will be ready for occupancy in June, and the 400-bed, $3,500,000 addition to the Hermann Hospital will be finished in October.

PRINCETON UNIVERSITY LIBRARY—Consisting of three stories underground of reinforced concrete and three stories above ground of steel-frame construction, this $6,000,000 structure at Princeton University has a book capacity of 1,800,000 volumes and seats 1,875. Book occupancy is scheduled for July.

GLEN OAKS VILLAGE—The initial section of this $30,000,000 rental housing project in Queens, N. Y., contains 576 units, now nearly finished. A second section of 2,342 apartments will be ready for tenancy in the spring. All buildings are two stories high.

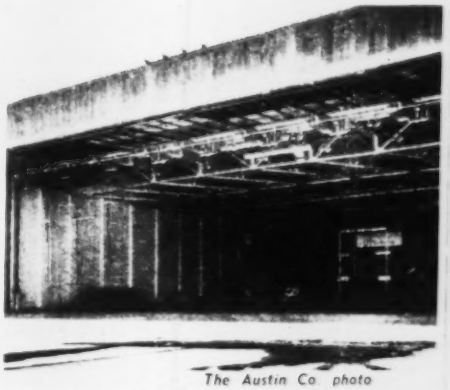
NEW YORK CITY HOUSING AUTHORITY—The John Lovejoy Elliott Houses, 608 apartments in four 11 and 12-story buildings, were completed in August. About 1,000 apartments of the Brownsville Houses, containing 1,338 apartments in 27



Ammann & Whitney photo

American Airlines—Largest commercial airlines hangar in the country. Built at a cost of about $3,000,000, it consists of twin, arched thin-shell hangars of 257-ft. clear span and 175-ft. depth and attached office and shop space.

Aluminum Company of America—Sheet and plate rolling mill under construction at Davenport, Iowa, with 43 acres of floor area, is to be partly in operation by April.



The Austin Co. photo

United Air Lines—One of three hangars in the new building in San Francisco.

three to six-story structures, are occupied, with full tenancy expected early in 1948. By summer, the following are expected to be finished: James Weldon Johnson, 1,310 units in ten 6, 10 and 14-story dwellings; Abraham Lincoln, 1,286 units in fourteen 6 and 14-story edifices; Amsterdam, 1,084 units in thirteen 6 and 13-story houses; Marcy, 1,717 units in 27 six-story structures; and Jacob Riis, 1,768 units in nineteen 6, 13 and 14-story buildings. It is expected that completion in 1948 will also be accomplished for Lillian Wald, 1,805 apartments in sixteen 10 and 14-story dwellings; Astoria, 1,104 units in 23 six-story houses; and Gowanus, 1,141 apartments in sixteen buildings varying in height from 4 to 14 stories. Sites are being cleared for five other projects to house 7,615 more families.

PARKWAY VILLAGE—Housing for the United Nations personnel in Queens, N. Y., is provided in 675 apartments in 110 two and three-story buildings, erected at a cost of about $10,000,000. Precast concrete floor slabs were used to speed construction, which is now completed.

BYRNE ORGANIZATION—In addition to the Molette development at Moline, Ill., where 511 houses will be finished by June, the $9,000,000 Harundale project's 1,137 one-story steel-frame dwellings near Glen Burnie, Md., are almost all ready for the purchasers. At Bettendorf, Iowa, 100 prefabricated aluminum houses are scheduled for October completion.

SIDNEY HILLMAN HOUSES—A co-operative apartment project in Manhattan, New York City, for the Amalgamated Clothing Workers of America, will provide 800 apartments at a cost of $9,000,000 in three 12-story buildings, the first of which will be ready for occupancy in November.

METROPOLITAN LIFE INSURANCE CO.—At Stuyvesant Town, a rental housing project in New York City, (*ENR* Feb. 5, 1947), 2,000 of 8,755 apartments in thirty-five 12 and 13-story buildings under construction are finished. At adjacent Peter Cooper Village, consisting of 21 fifteen-story edifices, 800 apartments of 2,494, are completed, and nearby Riverton's seven 13-story houses are ready for occupancy.

JOHN HANCOCK MUTUAL LIFE INSURANCE CO.—In addition to the 26-story addition to the home office under construction in Boston, a rental housing project, consisting of two-story buildings for 789 families, is under way in the Brookline-West Roxbury, Mass., area. Scheduled for completion this summer, John Hancock Village is said to be the largest private hous-

Metropolitan Life Insurance Co.—The Peter Cooper Village in New York City

ing development undertaken in New England since the war.

NEW YORK LIFE INSURANCE CO.—The $45,000,000 Fresh Meadow project in Queens, N. Y., includes two 13-story buildings, now completed, garages, a community center, and 2,400 units in 2- and 3-story houses, to be finished early in 1949.

KAISER COMMUNITY HOMES, INC.—Through the use of mass production methods, about 2,000 houses have been built near Los Angeles.

SEWERAGE AND DISPOSAL

DALLAS, TEX.—Let at a contract price of $2,550,000, work is about 75 percent complete on the first and second sections of the gravity portion of the East Bank interceptor sanitary sewer. The two sections include 7,390 ft. of 7½ ft., 6,290 ft. of 6½-ft. and 12,200 ft. of 6-ft. semi-elliptic sections, and 11,350 ft. of 60-in. and 2,900 ft. of 36-in. reinforced-concrete pipe. Another $617,000 contract, in progress for a force main from the Cadiz St. pumping station to the treatment plant, calls for 15,800 ft. of 60-in. reinforced-concrete pressure pipe and a river crossing. Plans for 1948 include construction of first two sections of White Rock Valley sewer (35,000 ft. of 60-in. and 54-in.), estimated to cost about $1,600,000, and of the Bachman Valley trunk sewer (35,500 ft. of 36-in. to 15-in.), estimated at $500,000.

OAKLAND, CALIF., AND VICINITY—Work will start in 1948 on a $24,000,000 treatment program administered by Special District No. 1 of the East Bay Municipal Utility District. The district, serving several cities in Alameda County, is concerned only with interception and treatment of sewage. Bids have been received on sewage pumps and pipe. Contracts will be called this year for interceptors, outfall, and some portions of a 100-mgd. primary treatment plant. Elimination of raw sewage from San Francisco Bay is contemplated by 1950.

SAN FRANCISCO, CALIF.—Bids will be called early in 1948 on four units of the North Point treatment program. Included are a $4,000,000 sedimentation plant, a $3,000,000 sludge treatment project, two 10-in. sludge force lines some 6 miles long, and various influent and effluent channels. During 1947, the Richmond Sunset plant was doubled in capacity.

BOSTON, MASS.—Let-to-date contracts on the $5,000,000 Nut Island treatment works amount to about $3,600,000. An 850-ft. wide fill from Hough's Neck to the island is complete. Concrete work for six sedimentation tanks located on this fill, foundations for the power plant and operating building and four digestion tanks is finished. Scheduled this year are contracts for the main superstructure. The 4-mile, digested-sludge disposal line, extending into the main channel of Boston Harbor, is under construction. Plans for extending the North Metropolitan Relief Sewer from Chelsea Creek to the system's outlet at Deer Island are being prepared. Bids will soon be asked for construction of the storm-overflow conduit at Alewife Brook and reconstruction of the pumping station at that point. Storm relief sewers along the north and south sides of Charles River basin are being designed.

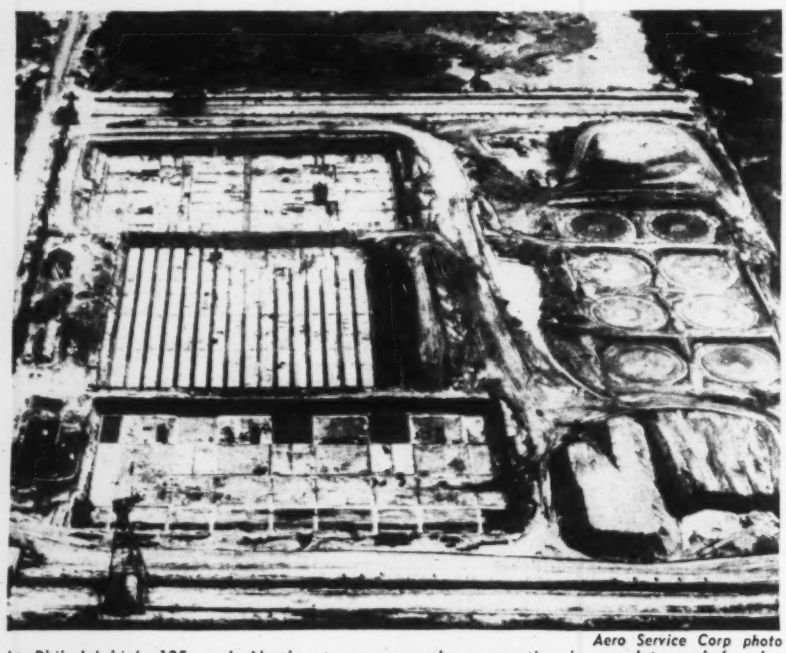
NEW YORK CITY—Construction of treatment works is stymied by a lack of funds. Execution of the $79,000,000 program depends upon adoption of an adequate financing plan. With the city's debt limit almost exhausted, a proposal to carry out this work through the board of Water Supply has been put forward. Plans and specifications are nearly complete for treatment projects at Hunts Point, Rockaway, Owls Head, Port Richmond and Newton. These plants will have a combined capacity of 445 mgd.

COLUMBUS, O.—Plans are complete for improvement and enlargement of the treatment plant to increase its capacity from 50 to 80 mgd. Proposed work includes new grit chambers; conversion of existing grit chambers into preaeration channels; replacement of aeration-tank diffuser plates with swing diffusers; additional sludge-digestion tanks to raise storage capacity from 1.7 to 3.0 cu. ft. per capita; tanks for digested-sludge supernatant and excess activated sludge; installation of a 1000 kva., power-generating gas engine; a 150,000 to 200,000 cu. ft. dry-type gas holder; and a 100-ton sludge incinerator adjacent to the existing 50-ton unit. Contracts for the grit chambers and air diffusion system have been let at a cost of about $800,000; remaining work is estimated at $1,200,000.

NORTHERN INDIANA—In 1947 the Carbide and Carbon Chemicals Corp., E. I. du Pont de Nemours and Co.; and U. S. S. Lead Refinery, Inc. completed sewerage work agreed upon in litigation involving the Calumet region. Other industries that have filed stipulations setting out their contributions and completed plans for waste treatment to control pollution in this area are: American Maize Products Co., Bates Expanded Steel Corp., Carnegie-Illinois Steel Corp., Cities Service Oil Co., Inland Steel Co., National Tube Co., Rogers-Galvanizing Co., Sinclair Refining Co., Socony-Vacuum Oil Co., Standard Oil Co., and Youngstown Sheet and Tube Co. Construction projects for most of these industries are well under way. Cost of work will be in excess of $11,000,000.

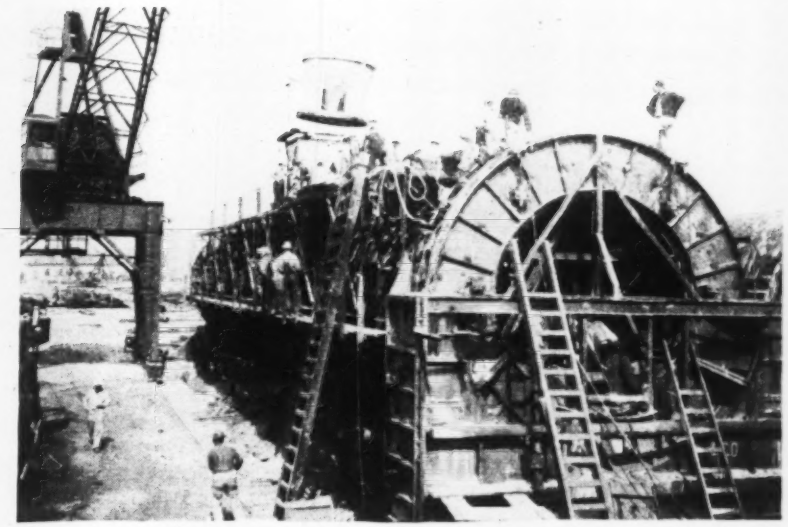
PITTSBURGH, PA.—The Allegheny County Sanitary Authority will recommend construction of a single, central treatment plant, with interceptor sewers to be laid beneath river beds. Total estimated cost of this plan for county-wide pollution abatement is $82,000,000. Under this plan all sewage will be diverted from rivers in the metropolitan area above the plant. Use of subaqueous locations, in part, instead of all-land alignment for interceptors is estimated to save $8,000,000 in costs.

STOCKTON, CALIF.—Bids received early in 1947 on a 20-mg. high-rate trickling filter plant were rejected as being too



Aero Service Corp photo

At Philadelphia's 125 mgd. Northeast sewage works, excavation is complete and foundations for primary, aeration, final and sludge tanks are being poured.



Cast and launched by shipyard procedures, the ocean end of Los Angeles' 12-ft. dia. sewer outfall serving the 245-mgd. treatment plant consists 22, 100-ft. long, 500-ton sections

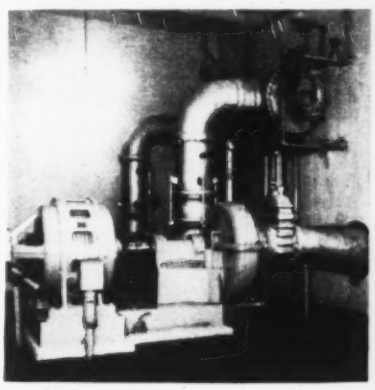
high. Bids were called on the primary treatment facilities only and a contract let for $1,330,000 as sufficient money for a complete plant was not provided by the bonds. Proposals may be called later this year for the remainder of the plant to cost about $1,000,000.

PENNSYLVANIA'S CLEAN STREAMS —Since initiation of the pollution-abatement program several years ago, 575 municipalities and institutions as well as 547 industries have been notified to cease discharge of sewage into streams or to submit plans for treatment facilities. In the first group, 433 communities have engaged engineers but only 102 have submitted plans. In the latter group, 301 concerns are designing treatment works. Planning and construction of anthracite-silt retention works in the Schuylkill River watershed has been intensified and under a joint federal and state project, removal of silt from this river is being carried out.

BALTIMORE, MD.—Construction of the 28.8 mgd., fully automatic, Dundalk pumping station that will handle sewage from more than six square miles has been completed. Provisions have been made for installation of two additional motor-driven centrifugal pumps to increase its capacity to 49 mgd. Ready for bid is a $650,000 project for installation of 30 rotary distributors at the Back River sewage works. These 157.5-ft. dia. units covering 18 of the 30 acres of trickling filters will apply settled sewage at the rate of 6 mg. per acre per day.

PHILADELPHIA, PA.—Contracts awarded on the 125 mgd. Northeast sewage works project now total $7,000,000. Work is underway on primary, aeration, final and sludge-digestion tanks, and installation of mechanical and electrical facilities for these units. Scheduled for advertisement early in 1948 are the blower house and gas holders. With plans for Southwest and Southeast treatment works, both of which will provide sedimentation and sludge digestion, approaching completion, bids for one of these projects will be taken probably this spring. The estimated cost of this three-plant program has increased from $42,000,000, to $58,000,000 since 1939.

CHICAGO, ILL.—Construction and equipment contracts amounting to over $24.7 million were awarded in 1947 by the Sanitary District of Chicago. The largest item was the $22,600,000 South Side Intercepting Sewer, consisting of 15,300 ft. of 18x 20 ft., 7,100 ft. of 18x18 ft., and 6,150 ft. of 16½x18½ ft. reinforced concrete sections in tunnel. Bids will soon be asked for completion of this 6¼-mile project that will ultimately drain 13 sq. mi. in five North Shore communities. In addition, superstructure contracts for the blower building at the Southwest Treatment Works and projects for additional sludge lagoons at the Calumet works were awarded. It is anticipated that $7,000,000 of work to bring all sewage under complete treatment and to extend needed intercepting sewers will be placed in 1948.



Recently completed, Baltimore's fully automatic, 28.8 mgd. Dundalk pumping station handles sewage from more than 6 sq.mi.

Under the Bureau of Sewers, two contracts are under way for a $60,000,000 sewer program involving eight systems with a total length of 110 miles.

TOLEDO, OHIO—Plans will be completed this summer for complete treatment of the city's sewage, which currently receives primary treatment only. Estimated cost of the improvement is over $5,000,000, requiring a bond issue to be voter approved.

AKRON, OHIO—Plans are being prepared and initial contracts are expected to be awarded this year for modernizing the 20-year old treatment plant to handle 67.5 mgd. Planned improvements include construction of a new 37.5-mgd. activated-sludge plant and remodeling the existing Imhoff tank, trickling-filter plant to accommodate an average flow of 30 mgd of sewage.

NORFOLK, VA.—The Federal Works Agency has completed its portion of the $16,000,000 Hampton Roads sanitary sewer, undertaken jointly with the Hampton Roads Sanitation District Commission. Work included 72 miles of sewers and force mains, 17 pumping stations and a treatment plant. Completion projects financed by the commission and Portsmouth, Va. and totaling $10,000,000 are scheduled for this summer.

PORTLAND, ORE.—Progress on the $12 million interceptor and disposal program has been slow because of price conditions. Bids on two units advertised in 1947 were rejected as too high. Orders were placed for some $165,000 of treatment equipment with the major plant contract to be let at a later date when equipment deliveries are assured. One major portion of the interceptor system, the Columbia Slough section, is under contract for $460,000 and a $54,000 section was completed in 1947.

LOS ANGELES, CALIF.—Contracts under way on a $30,000,000 disposal program showed the following percentage completion as of Jan. 1. (figures in parentheses are contract amounts): Headworks building ($1,385,000)—45 percent; 12-ft. dia. outfall extending 5,000 ft. off-shore (about $3,500,000)—70 percent; and site preparation, including moving some 14,000,000 cu. yd. of sand (about $3,500,000)—55 percent. The outfall is scheduled to be put in service early this year but headworks-building completion will depend on equipment delivery dates. Contracts will be let in 1948 for the following units of the 245-mgd. activated-sludge plant: (1) Filters, driers and fertilizer storage system, (2) digestion systems, (3) power and blower plant, (4) warehouse and shops, and (5) administration and laboratory building.

OMAHA, NEB.—Work on the $1,500,000 South Omaha storm and sanitary sewer

has started with a $213,000 contract for the outlet section. After excessive bids for the 3,300 ft. long, 12-ft. dia. steel-liner-plate tunnel had been rejected twice in 1947, the project was divided into three sections for the third letting, and this contract awarded.

HONOLULU, T. H.—Scheduled to start in 1948 is a $14,500,000 program. Included are a 78-in. concrete outfall extending 3,600 ft. off-shore, two 48-in. harbor siphons under 55 ft. of water, a $3,500,000 disposal plant, two pumping stations, and a 6,000-ft. tunnel.

BUFFALO, N. Y.—Work has started on the $1,600,000 "Quarry Project" to relieve stormwater flooding in the Bailey-Kensington area. Utilizing an old quarry as a retention basin, the project involves construction of sewers into the basin, a pumping station and discharge outlet.

HOUSTON, TEXAS—The Simms Bayou 18-mgd. treatment plant is 98 percent complete and operation probably will start in April. Constructed at a cost of $1,125,000, the plant will add to treating capacity and make it possible to discontinue operation of a plant in a residential area. Bids will soon be asked on the $1,000,000 second section of the 2,000 sec.-ft. Country Club Bayou storm sewer. Scheduled for completion in late 1948, this project will remove runoff from the Houston—Galveston superhighway.

From Druid and five shafts, hard-rock tunnelling is underway on Baltimore's 17½-mile water conduit to develop a supply in the Upper Patapsco River valley.

MUNICIPAL WATER SUPPLY

SEATTLE, WASH.—Contracts for reservoirs, supply and distribution mains, and a pump station totaling $756,000 were completed in 1947. Still in progress are contracts amounting to almost $2,000,000. Largest job under way is a 5½-mile section of 66-in. steel pipeline to cost more than $1,000,000.

MOKELUMNE AQUEDUCT—Contracts have been let for purchase of pipe and installation of all but 10 miles of it on the supplementary 82-mile line being built for the East Bay Municipal Utility District that serves Oakland, Calif., and nearby cities. Costing some $22,000,000, this project should be completed early in 1949. Other Utility District work includes two prestressed reinforced-concrete reservoirs under construction and two contemplated for 1948 as well as some 80 miles of distribution mains.

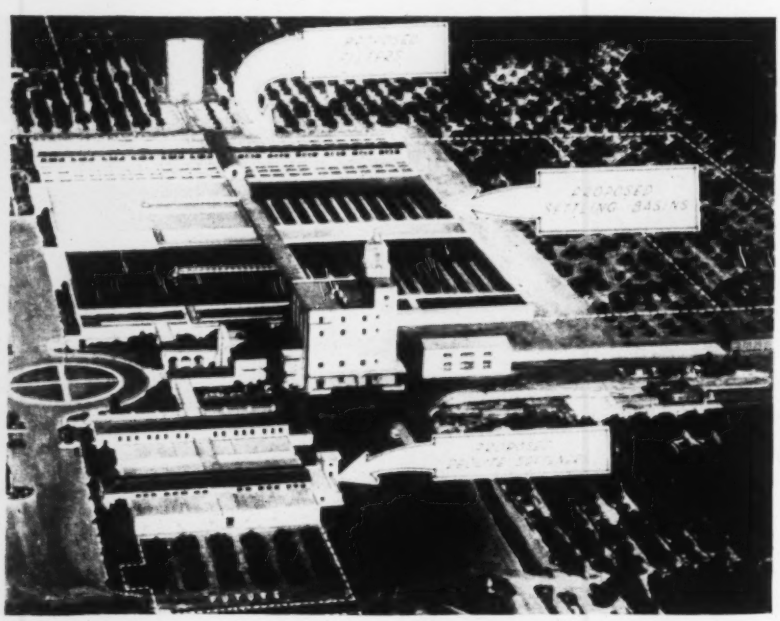
SAN DIEGO, CALIF.—With completion and dedication of the 71.1-mile San Diego Aqueduct in December 1947, Colorado River water is available to San Diego to supplement its short supply. In construction under some $3¼ million of contracts, pipelines to bring additional water from the aqueduct terminus into the city will be ready for use this year. In 1948, construction of a 66-mgd. filtration and softening plant which will cost about $2¼ million is expected to start. Some $350,000 in equipment contracts have been let. The San Diego County Water Authority has $1,850,000 worth of contracts in progress; on completion of this work, about August 1948, the seven agencies of the authority, including San Diego, will use Colorado River water.

PHOENIX, ARIZ.—Some $4,400,000 of a $6,000,000 program is under way including contracts for a 30-mgd. filter plant, a 1,000-hp. booster station, a 30-mg. reservoir and some 30 miles of 12- to 48-in. mains. Yet-to-be-let contracts will cover Horseshoe Dam spillway gates (about $830,000) and small distribution lines aggregating some $300,000.

CHICAGO, ILL.—With its 320 mgd. South District filter plant—the world's largest—almost complete and in full operation, Chicago is embarked on preparation of plans for another plant three times as big. Designed to serve the Central and North districts, this $62,000,000 treatment station will have a rated capacity of 950 mgd. and a maximum of 1,200 mgd. Engineering work is being delayed pending acquisition of a plant site.

CLEVELAND, OHIO—Construction will soon start on Nottingham intake in Lake Erie. A contract for $4,250,000, covering the lake section, includes a 76-ft. dia. cellular steel crib in 52 ft. of water; 18,300 ft. of 10-ft. dia. concrete pipe, in trench along the lake bed; and 1,200 ft. of stone breakwater to prevent shore erosion and provide harbor for the contractor's marine equipment. A second contract, for $1,300,000, covering the shore section, includes 3,300 ft. of 10-ft. dia. concrete-lined tunnel, to the proposed plant site. Initial contracts will be awarded this year for the Nottingham plant, a 100-mgd. rapid-sand filtration project scheduled for completion in 1951 at a cost of $8,500,000.

TOLEDO, OHIO—An 8,600-ft. extension of the principle crosstown main with 36-in. prestressed concrete pipe, started last year.



To double its 100 mgd. capacity, additional settling basins, filters and zeolite softeners will be constructed this year at the Water Softening and Filtration Plant of the Metropolitan Water District of Southern California which processes Colorado River water.

is expected to be completed and placed in service by May. Next major improvement probably will be a 72-in. trunk main from Collins Park pumping station to the west side of Maumee River, duplicating an existing line. This project is estimated to cost more than $2,000,000.

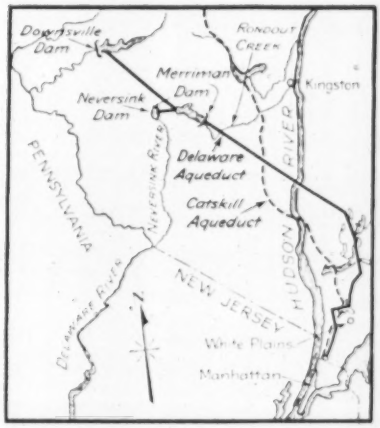
SAN FRANCISCO, CALIF.—Initial contracts for construction of a second Hetch Hetchy aqueduct are expected to be let late this year. Scheduled for completion in 1950, the project is estimated at $12½ million.

BOSTON, MASS.—The Metropolitan District Water Supply Commission was abolished on July 1, 1947. Its activities were absorbed by the Metropolitan District Commission, a newly formed Construction Division taking over building activities and the Water Division assuming control of utility operation. A 126-in., steel-plate, concrete-encased, inverted siphon on the Wachusett Aqueduct is being constructed under Assabet River. Shafts 6 and 7 on the City Tunnel section of Hultman Aqueduct were completed in 1947 at a cost of over $500,000. From a four-contractor combination, a low bid of $9,530,000, was received for construction of City Tunnel which includes about 4.7 and 0.6 miles of 12- and 10-ft. section, respectively. Scheduled for completion in 900 days, work will be started upon approval of award.

BALTIMORE, MD.—Six headings on the first section of the 17½-mile supply tunnel to tap water resources of the Upper Patapsco River are being driven. Costing about $9,150,000, this work includes 14,200 ft. 10-ft. concrete-lined section and tunnelled installation of 21,700 ft. of 7-ft. concrete pipe. Plans for the final section are nearly complete. Estimated to cost over $8,000,000, this second project probably will be offered for bid this summer. As soon as the right-of-way has been secured, a 7000-ft. sub-aqueous pipeline across Baltimore harbor will be advertised. Consisting of about 3800-ft. of 48-in. reinforced concrete pipe on under-water trestle and 30-in., 36-in. and 48-in. land connections, this work is estimated at more than $2,500,000. To meet increasing water demands, plans have been completed for installation of a new, $85,000, 50 mgd. motor-driven centrifugal pump at Hillen pumping station.

PHILADELPHIA, PA.—Compelled by an urgent need for improvements, a $5,000,000 annual waterworks expenditure for the next four years is being arranged. Under this schedule new filter plants, revamping of pump stations and extensions to the distribution system will be provided. All projects are designed to fit any of the proposed sources of supply development.

NEW YORK CITY—About 2,000,000 cu.yd. of 6,000,000 cu.yd. of rolled-fill in Merriman Dam was placed this year bringing the project to about 33 percent complete. Plan is to complete earth moving and start storage this year. At Neversink Dam the 975-ft. long concrete cut-off



For New York's new Delaware River water supply system, three dams are under construction, Merriman, Neversink and Downsville. The aqueduct to Merriman Dam was completed before the war.

wall was about 75 percent complete. Nineteen 12 x 45 ft. caissons were set up at the bottom of a 75 ft. deep well-point-protected trench and sunk to depths as great as 100 ft. Contract for the rolled-fill dam has not yet been awarded. Downsville Dam on the East Branch of the Delaware River got under way late in 1947 with award of a $14,000,000 contract for diversion works and cut-off wall. The dam will be rolled-fill similar to Merriman and Neversink. Total spent to date on the Delaware Water Supply project to bring half a billion gallons daily of water to New York City is $175,000,000.

YOUNGSTOWN, OHIO—Scheduled for completion early this year is the $1,250,000 Springfield Dam and reservoir on Yellow Creek. This 4,100-ft. long, 42-ft. high earth-fill dam, with concrete spillway, will form the eighth and largest of a series of reservoirs owned by the Ohio Water Service Co. The new reservoir will impound 2½ billion gallons of water, and increase the output by 40 percent.

LOS ANGELES AND ORANGE COUNTIES, CALIF.—A $2,592,400 first contract has been let for doubling capacity of the 100 mgd. La Verne softening and filtration plant of the Metropolitan Water District of Southern California. Expected to cost $4,000,000, the expansion includes two mixing basins, two settling basins, rapid sand filters, zeolite softener building and five salt bins.

SALT LAKE COUNTY, UTAH—Low bid received Jan. 14 on a suburban sewerage project was $2,359,874. This project will provide sewers for a 15-sq.mi. area outside of Salt Lake City. A primary treatment plant was bid at $278,000. If the county accepts the bids, work will be under way by March.

DENVER, COLO.—A $30,000,000, five-year program to increase capacity from 180 to 230 mgd. has been started. Less than 10 percent of the work is in progress, but another 10 percent probably will be finished in 1948. Water supplies on the western slope of the Continental Divide are being developed, and a large reservoir on the eastern slope will be built as well as a hydro station to generate power from water dropping to the city. During 1947, about 6 miles of 30-in. conduits were completed and construction of a 24-mg. filtered water storage reservoir was started.

DES MOINES, IOWA—Construction began recently on a 48-mgd. treatment plant to augment the infiltration gallery supply by taking water from Raccoon River. Including lime-soda ash softening, the project will cost about $2,000,000.

NEW ORLEANS, LA.—Soon to be asked, bids for furnishing and installing 7 miles of cast-iron mains, 48- to 36-in. dia., are expected to approach $2,670,000. Projected work includes 14,240 ft., 48-in.; 9,200 ft., 42-in.; and 13,400 ft., of 36-in.

MIAMI, FLA.—Sanitary sewers and disposal facilities will be constructed under a $15,000,000 program, recently approved. A $5,600,000 sewer project covering nearly two-thirds of the city has been let. Other contracts to complete the program probably will be advertised soon.

KANSAS CITY, MO.—Two large projects are under construction: (1) a 7½-mile 48-42-36-in. reinforced-concrete force main at a cost of $2,250,000, and (2) rehabilitation and modernization of Turkey Creek steam pumping station, at a cost of $520,000. In the latter project, a new 30-mgd. turbine-driven centrifugal pump with a 30,000-lb.-per-hr. boiler operating at 400 psi., 825 deg. F. is being installed.

MIAMI, FLA.—A new $10,000,000 waterworks system for Metropolitan Miami is being designed. It will include an 80 mgd. softening and purification plant, one-half of which will be built in the next few years; deep wells equipped with electric-driven pumps, gasoline-engine standbys and remote controls; and about 16 miles of 20- to 48-in. mains.

DALLAS, TEX.—Enlargement of the purification plant under four contracts totaling $1,300,000 will increase its capacity from 75 mgd. to 100 mgd. Work under way includes: two 33-mgd. flocculators, chemical building, a 5-mgd. filtered reservoir, and eight new filters. Items completed are a 33-mgd. clarifier, a 100-mgd. mixer, a 33-mgd. flocculator, and a 500,000-gal. wash-water tank.

SAGINAW-MIDLAND, MICH.—Over 60 mi. of 48- and 36-in. prestressed concrete pipe was laid in open trench last year on the 78-mi., $12,000,000 pipeline project which will carry Lake Huron water to Saginaw and Midland, Mich. Construction of the entire project, including 2 mi. of 66-in. steel pipe intake line at Whitestone Point, two pumping stations and a 5-mg. concrete reservoir, is 75 percent completed. With operation of the new line expected to start late this summer, initial

capacity of the system will be 43 mgd. Provisions have been made to meet future water-supply requirements, for increasing total pumpage to 71 mgd.

AKRON, OHIO—Two contracts are underway to enlarge the 33-year old treatment plant to a 50-mgd. rated capacity. One project covers installation of 1,600 ft. of 60-in. concrete pipe, a second raw-water conduit from reservoir to plant. The other involves construction of a 75-mgd. raw-water pumping station. Contracts are expected to be awarded early this year for two 40,000-lb. per hr. steam-generating units, a 20-mgd. steam-turbine pump and two 500-kwh. generator units. Other future improvements include a new chemical building and additional flocculation and settling basins.

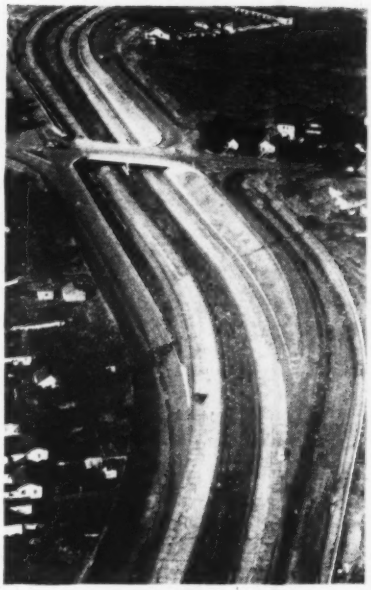
TRANSPORTATION

BROOKLYN-BATTERY TUNNEL—Tunnel excavation from Manhattan to the Governors Island ventilation shaft, a distance 3,900 ft. is complete and 75 per cent of the 31-ft., dia. cast-iron lining has been erected. Shield-driving from Brooklyn has been carried into the rock reef at Governors Island, 2,300 ft. from construction shafts, and placing of concrete lining has started; bottom drifts in rock have been driven for the remaining 1,000 ft. to within 15 ft. of the Manhattan headings; enlargement to full tunnel-section is partially completed. Erection and concreting of the steel caisson for Governors Island ventilation shaft has been finished and the caisson sunk to within 12 ft. of its final position, but requires pneumatic methods for completion. Cut-and-cover sections in Manhattan and Brooklyn are well advanced. About two years of active work are required to complete the project.

PENN-LINCOLN PARKWAY—Work on this Pittsburgh, Pa. highway is expected to be pushed this year, with $17,270,000 in contract to be let. Totalling $1,467,000, projects for two bridges were awarded in 1947. Nearing completion are nine bridges and 1¼ mi. of four-lane pavement. When completed, this 9½-mi., $40,000,000 parkway will connect downtown Pittsburgh with U. S. Highways 22 and 30, east of the city. Bids are asked March 12 on the twin-tube, 1,225 ft. tunnel under Squirrel Hill.

HARBOR DRIVE EXPRESSWAY, PORTLAND, ORE.—Contracts awarded last year on the six-lane, $8,000,000 Harbor Drive Expressway totaled $1,130,000 for ¾-mi. of grading, paving and structures. This year the state highway department plans to award contracts for another section one-third mile long, including a four-level interchange, expected to cost $1,800,000.

COLORADO MOUNTAIN HIGHWAY—An alternate route for U. S. 40, running 12.4 miles west from Golden, is under construction at an estimated cost of $5,000,000. About $1,500,000 has been spent in driving five tunnels up to 1,037 ft. long for this route, and the state highway department will spend $1,250,000 this year to extend the road 2 miles westward from the newest tunnel.



California's North Sacramento Freeway was completed in 1947.

BLUE RIDGE PARKWAY—Of the 477-mile Blue Ridge Parkway, extending from Shenandoah National Park to the Great Smoky Mountain National Park, 199 miles are graded, paved and open to traffic. In addition, macadam base for 117 miles is in place and 8 miles is graded. In 1948 the Public Roads Administration plans to complete a 55-mile stretch. It is expected that four contracts for 12 miles of grading and base course and two contracts for 43 miles of bituminous surfacing will be let this year. Contracts now in force include

Ostergaard Photo

Last year New Jersey completed 3.3 miles of eight-lane expressway on Route 25 near Newark, and is extending it to the Pulaski Skyway.

grading of 13 miles, laying of the asphaltic-concrete top for 63 miles, and steel superstructure for one bridge.

CLEVELAND FREEWAYS—A 3.2-mi. link in the two-lane pavement for eastbound traffic on the Lakeland Freeway, between Gordon Park and East 140th Street in Cleveland, Ohio, was opened to traffic in December 1947. Work amounting to $3,000,000 will be placed this year for completion of this section, including the $2,000,000 Eddy Road interchange and railroad grade-separation. Three contracts totalling $5,091,000 were let last year for 4 miles of the Willow Freeway on U. S. Highway 21 in Cleveland, Newburgh Heights and Cuyahoga Heights Village.

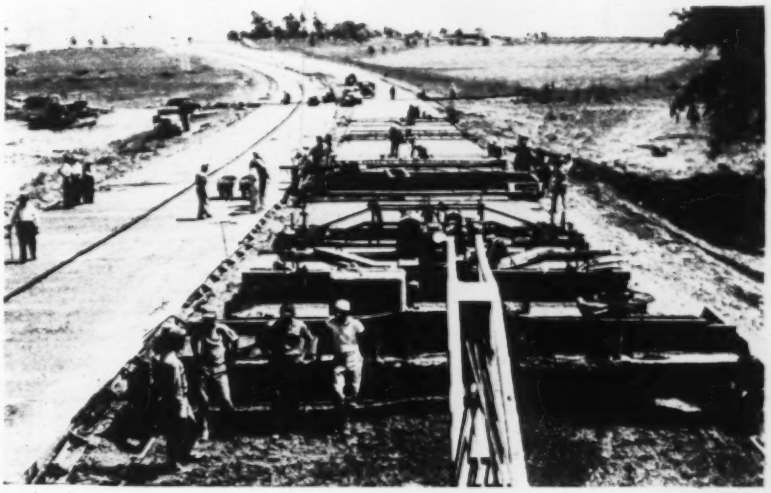
CINCINNATI-DAYTON EXPRESSWAY—Work was started last fall on a $2,850,000, 1½-mi., four-lane, divided pavement and a large railroad grade-separation on U. S. Highway 25 in Cincinnati, a part of the Cincinnati-Dayton expressway. A 1½-mi. extension, from Stewart to Fourth Street in Dayton, is expected to be placed under contract this year at an estimated cost of $3,000,000.

BARTLESVILLE ACCESS HIGHWAY—Stage building has begun on a $3,150,000 relocation of U. S. Highways 60 and 75, involving a total length of 17½ miles, in the vicinity of Bartlesville, Okla. The project will furnish all-weather access to Bartlesville, at present frequently isolated by high waters of the Caney River. During 1947, 11.3 miles of grading, drainage, and bridges were completed at a cost of $921,000. Steel for bridges on U. S. 60 has been purchased and erection will start soon. Total project cost, exclusive of right-of-way, is estimated at over $2,700,000.

CALIFORNIA FREEWAYS—In 1947 the Terminal Island Access, Cabrillo and North Sacramento freeways were almost complete and opened to traffic. Some sections of the Santa Ana and Bayshore freeways were open for travel. Contracts in effect at the end of the year on various freeways total as follows: Harbor—$375,496, Santa Ana—$2,520,652, Bayshore—$7,815,995, East Shore—$961,836, Hollywood—$2,111,305 and the Arroyo Seco—$818,459. A four-level grade separation connecting Harbor, Hollywood and Arroyo Seco Freeways is under construction with contracts totalling $683,600.

CONNECTICUT PARKWAYS—Contracts completed during 1947 on the Wilbur Cross Parkway totaled $2,900,000 for nine bridges and 16 mi. of paving between Hamden and Meriden. Scheduled to be let this year are eight bridges to cost about $1,950,000. On the Wilbur Cross Highway, five bridges and 13 miles of paving were completed last year between Tolland Station and the Massachusetts state line, at a total cost of $1,800,000. Contracts for 16 miles of grading and paving, to cost about $1,300,000 will be advertised this year.

CONGRESS STREET EXPRESSWAY—Construction on the expressway proper has not started, but Chicago purchased $2,240,000 worth of right-of-way last year and completed negotiations for 100 parcels of real estate to cost $2,350,000. Twenty commercial buildings and 32 residences west of the Chicago River have been wrecked to make way for the new expressway. Construction of subway tubes in Congress Street, which must be completed before the expressway can be built in that region, is about one-third finished.



Indiana paved a bypass around Franklin with two 24-ft. lanes separated by a 4-ft. median.

Nine and one-half miles of Connecticut's four lane Wilbar Cross Parkway were opened to traffic last year. Additional mileage is under construction.

NEW JERSEY EXPRESSWAYS—On Route 25 between Newark Airport and Elizabeth, 3.3 mi. of eight-lane divided highway was completed last year at a total cost of $3,200,000. This project is being extended 2.1 mi. to the Pulaski Skyway and includes $3,900,000 for 12 bridges and $800,000 for grading. Paving contracts estimated at $1,200,000 are expected to be awarded this year. Right-of-way for this 2.1-mi. section of highway cost $1,600,000.

Work completed last year on New Jersey's first freeway, Route 100, between the Raritan River and the George Washington bridge, included 4.4 mi. of grading and drainage for the proposed eight-lane divided highway at a total cost of $2,700,000, exclusive of $2,100,000 for right-of-way. Contracts also were awarded for grading and drainage on 2.3 mi. of the expressway, totaling $1,500,000. Right-of-way costs for this section totaled $1,200,000. Some $5,000,000 is scheduled for construction and purchase of rights-of-way in 1948.

NEW YORK CITY EXPRESSWAYS—Two contracts totaling $1,290,000 were awarded last year on the $14,000,000 Brooklyn-Queens Expressway in metropolitan New York. One small contract was awarded, and three totaling $870,000 are pending, on the proposed Cross Bronx Expressway, estimated to cost $34,000,000. Scheduling of work to be placed under contract this year on both expressways depends on state legislative action to permit financing.

BOSTON EXPRESSWAYS—Two contracts totaling $1,300,000 for 2.8 mi. of expressway were completed last year on the Northern Circumferential Highway around

Harvard St. Bridge—Construction of the $2,000,000, three-span, cantilever highway bridge in Peoria, Illinois, has been suspended due to ice in the Illinois River. Scheduled for December completion, one span of the 5,000-ton superstructure has been erected.

the Boston (Mass.) metropolitan area. A 2-mi. section of this four-lane divided expressway will be placed under contract this year, at an estimated cost of $1,200,000. Plans are nearly complete for the $6,500,000, six-lane East Boston Expressway, the final link connecting Boston harbor vehicular tunnel with Logan International Airport and main North Shore highways. Starting of construction has been delayed due to difficulty in securing rights-of-way.

GLOUCESTER (Mass.) EXPRESSWAY—Work was started last year on the Gloucester Expressway, under a $1,500,000 contract for grading and draining 2.4 mi. of the four-lane highway. When completed next year, this $5,000,000 improvement will connect Gloucester with the mainland. Contracts will be awarded this year for four grade-separation bridges expected to cost $700,000, and an 800-ft. long, $2,000,000 high-level bridge over the Annisquam River.

DETROIT EXPRESSWAYS—Contracts totaling $2,175,000 on the John C. Lodge Expressway will be completed this year, and $2,000,000 of new work probably will be placed. To date, $4,250,000 worth of right-of-way has been acquired, and an additional $1,000,000 is being secured. Total right-of-way costs will be $8,300,000. Greatest single deterrent to steady progress of the project is slow delivery of pipe for large water mains to be relocated. During 1947, one construction contract for $630,000 was awarded and $1,900,000 in rights-of-way were secured for the Edsel Ford Expressway in Detroit. This year probably $2,200,000 worth of work will be let, and $2,000,000 of right-of-way purchased.

COLUMBIA RIVER HIGHWAY—Relocation and modernization of the Columbia River Highway through the Columbia River gorge east of Portland, Ore., started again in 1947. Totaling $5,710,000, this 18½-mile new project will include controlled access and separation of cross traffic. Major item is construction of embankment by hydraulic dredging totaling almost 8½ million cu. yd. Paving will be contracted for late this or early next year.

TACOMA NARROWS—Low bids for rebuilding the Tacoma Narrows Bridge received in October, 1947, totaled about $11,200,000. Contracts were not let because bids on a $14,000,000 financing bond issue were not received. The low bidders have extended expiration dates to March 15 to give the toll bridge authority time to work out new financing.

SAN FRANCISCO BAY CROSSINGS—Formation of a special division of the California Department of Public Works for San Francisco Bay toll crossings highlighted recent progress preparatory to construction of one or more new crossings to relieve the overcrowded San Francisco-Oakland Bay Bridge. Preliminary investigation and design for proposed crossings will require some two years.

WASHINGTON, D. C.—Two bridge projects, an elevated highway, and a big highway underpass, were advanced last year and will go rapidly ahead in 1948. On South Capitol St. foundations for another highway crossing over Anacostia River have been completed at a cost of $2,500,000. Work on the $2,223,000 superstructure, a plate-girder with a main crossing 854 ft. long, including a 386-ft. swing span will start soon.

To replace the old steel-truss bridge over Potomac River on 14th St., two four-lane plate-girder crossings are being constructed. A $2,700,000 project for foundations of the first bridge is well advanced. Bids for its superstructure were opened Jan. 15.

Each crossing will consist of a series of continuous plate-girder units with main spans 165 ft., plus a 105-ft. double-leaf bascule span at the main channel. After the first bridge is complete, the existing crossing will be torn down and replaced. Cost of the crossings will total over $7,000,000.

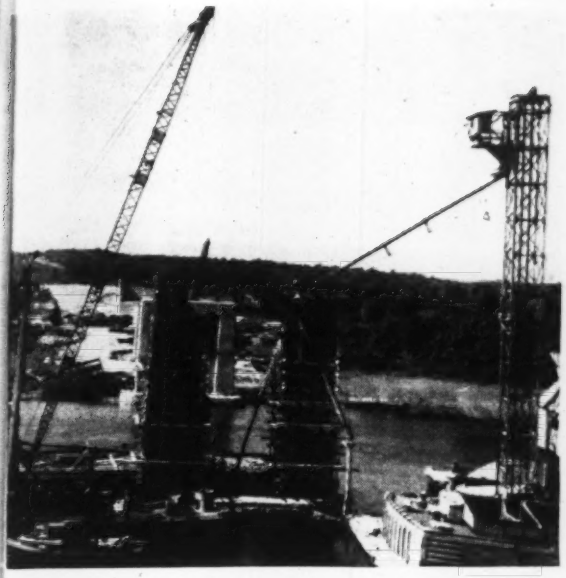
A four-lane elevated highway about one mile long was placed under construction in 1947 along K St. to provide a better approach to Key Bridge. One $3,300,000 contract for this work has been let. Construction of a four-lane underpass on Connecticut Ave. plus two street car tracks under Dupont Circle was also begun to cost about $5,000,000. A $3,951,000 contract for the underpass proper is in progress.

SHIRLEY MEMORIAL HIGHWAY—Grading is nearly complete for the $6,000,000, 15-mile extension of Virginia's Shirley Memorial Highway, about 1½ miles have been paved, and most of the major drainage and grade-separation structures are underway. Work on this limited-access, divided expressway leading southwestward from the Washington, D. C., area, will be completed in 1949. A total of about $4,500,000 of work had been awarded at the end of 1947 and during 1948 contracts will be awarded for seven miles of paving, for two traffic interchanges, seven bridges, and about two miles of service roads.

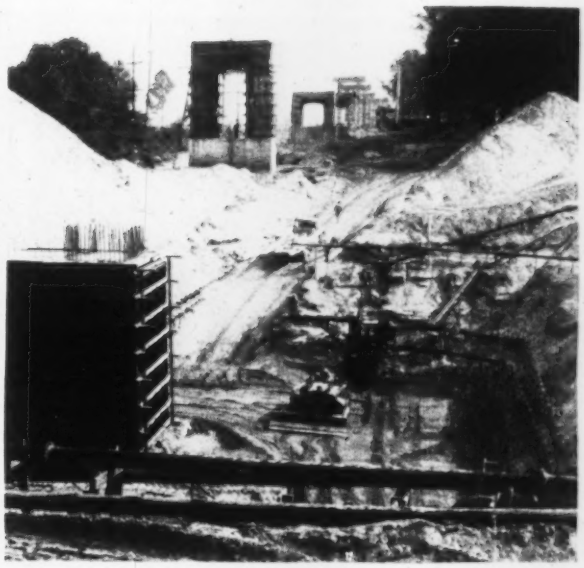
EAST ST. LOUIS—ST. LOUIS BRIDGE—Preliminary work on the $9,500,000 McGlynn toll highway bridge across the Mississippi River was done in 1947, after award of a $6,500,000 contract. Revenue bonds to finance construction, approved by the City of East St. Louis, are expected to be sold soon.

ONTARIO HIGHWAY 2A—Completed during 1947 was a 19-mile section of the four-lane divided highway that ultimately will run across southern Ontario from the Michigan border opposite Detroit to the Quebec border near Montreal. This section runs from West Hill, near Toronto, to Oshawa. It is made up of two 22-ft. concrete pavements separated by a 30-ft. wide depressed mall, which will be used to store snow during the winter.

TOLEDO LAKEFRONT TERMINAL—Under construction since June, 1946, the $18,500,000 lakefront terminal of the Baltimore & Ohio and New York Central Railroads on Maumee Bay at Toledo, Ohio, is nearing completion. The project comprises three earth-filled, steel sheetpile bulkhead piers carrying three car dumpers, two ore unloaders and a rail yard with 56 miles of track. Nine large lake vessels can be berthed at the piers, which have a total bulkhead length of 8,400 ft. Two car dumpers and two ore unloaders will be ready



Raymond E. Baldwin Bridge—Construction of this 2,450 ft. long high-level bridge across the Connecticut River was started last March on U. S. Route 1 between Old Lyme and Old Saybrook, Conn. Estimated at $6,500,000, project completion is planned for December, 1948.



Chain of Rocks Canal Bridge—Being built over dry land, this 2,370-ft. bridge will carry highway U. S. 66 over the future canal in Illinois near St. Louis. The pier in the foregound will support the east end of the 465-ft. through truss main span.

for operation at the opening of Great Lakes navigation in April, 1948.

NORFOLK & WESTERN DOUBLE TRACK—Construction of 5.2 miles of double-track main line, 11 miles west of Bluefield, W. Va., was begun during the year by the Norfolk & Western Ry. Included is a double-track tunnel 6,900 ft. long. Work is about 10 percent complete. It will cost $12,000,000. The same railroad is completing a fire-proof pier at Lambert Point, Va., costing about $6,000,000.

CHAIN OF ROCKS CANAL—Late in November work started on a $16,626,000 contract for construction of the locks for an 8-mile canal past the Chain of Rocks reach of the Mississippi River above St. Louis. The canal is to be on the Illinois side of the river. Included in this contract is construction of the main lock, 1,200 ft. long and 110 ft. wide, the largest on the Mississippi system; an auxiliary lock, 600 x 110 ft.; and about 2,000,000 cu. yd. of levee work. Construction of the canal is to be by a separate contract. It will be 8.4 miles long, 550 ft. wide at the top and 9 ft. deep, involving about 28,000,000 cu. yd. of excavation. Construction of a $1,585,000 highway bridge across the proposed channel is 65 percent complete. The whole project will require about 4 years to build.

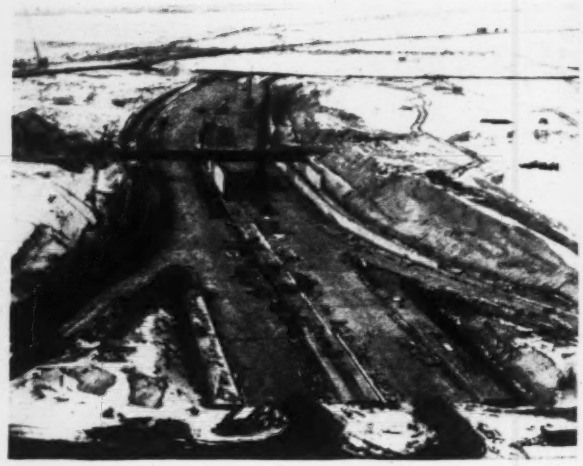
UNION PACIFIC TUNNEL—Paralleling a single-track tunnel at Aspen, Wyo., the Union Pacific R. R. is driving a second $8,000,000, 6,700-ft. tunnel to complete double-tracking of its Omaha-Salt Lake City line. Both approach cuts have been completed, and tunnel excavation, started in August, had progressed 500 ft. at the end of the year. During 1948, the main bore will be extended to about 5,000 ft., with completion expected early in 1949.

MAINE TURNPIKE—The 50-mile long four-lane separated turnpike from Portland to the New Hampshire border was paved for its full length last summer and opened to traffic on Dec. 13. A toll project of the Maine Turnpike Authority the road cost $20,000,000, including two major bridges and many smaller ones. Traffic use and toll return is "gratifying."

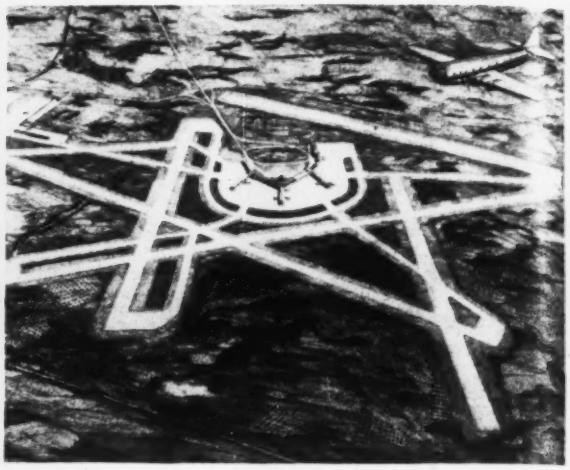
MYSTIC RIVER BRIDGE—A $27,000,000 bridge over the Mystic River between Charlestown and Chelsea in metropolitan Boston now is in the contract stage with active work on piers for the Little Mystic River crossing. The entire bridge will be 11,700 ft. long with a three-span cantilever through truss at a height of 135 ft. over the water for the central 800 ft. span. Bonds payable solely from toll revenues will be used to finance the structure, scheduled for opening in 1950.

CHICAGO SUPERHIGHWAYS—During 1947, $4,490,000 in right-of-way was bought and 52 buildings were demolished on the Congress St. Superhighway. The city, the state and Cook County are jointly building the Northwest, Wacker Drive and Southwest routes, estimated to cost $77,000,000, $12,500,000 and $30,000,000, respectively. A similar agreement is being negotiated for the South route. In 1948, $6,000,000 for right-of-way for West Congress St., Wacker Drive and Northwest routes will be spent. Bids will be taken for two overpasses and major drainage on the Congress St. expressway. A $1,000,000 section of Wacker Drive will be placed under construction.

Canal St. Bridge—This double-leaf bascule structure soon will be carrying traffic over Chicago River but will be operated by temporary equipment for about a year. The bridge is 68 ft. wide with a 170-ft. clear span, 21 ft. above the water.



New York International Airport—Underpass under two taxiways will carry main approach roads to airport at Idlewild, which is scheduled for use in July. The bottom is below water level so 7-ft. thick slabs are used to prevent uplift.



Baltimore Airport—Grading for three runways has been completed and plans are approved for an unusual airport terminal that keeps passengers at the second-floor level by way of extensible ramps to the plane.

CHICAGO SUBWAYS—Work on the final contracts of the Milwaukee Ave.-Dearborn St.-Congress St. subway is progressing toward completion scheduled for the middle of 1949. At the end of 1947, shield mining was completed for 750 ft. of double tubes on the $8,235,000 project at the south end of the system, and steel sheetpiling, 70 ft. long, is in place for a 60x230-ft. open-cut crossover section, now being excavated 60 ft. deep. Between the crossover and the east bank of the South Branch, Chicago River, a station platform and stub-terminal tracks are being built.

A $1,883,000 contract for furnishing and installing track, contact rail and duct benches was awarded in December. It was expected that signal equipment, circuit breakers and supervisory control equipment totaling $717,000 will be purchased. At the north end of the subway, the $663,000 incline to elevated rapid transit tracks was nearly complete on Jan. 1.

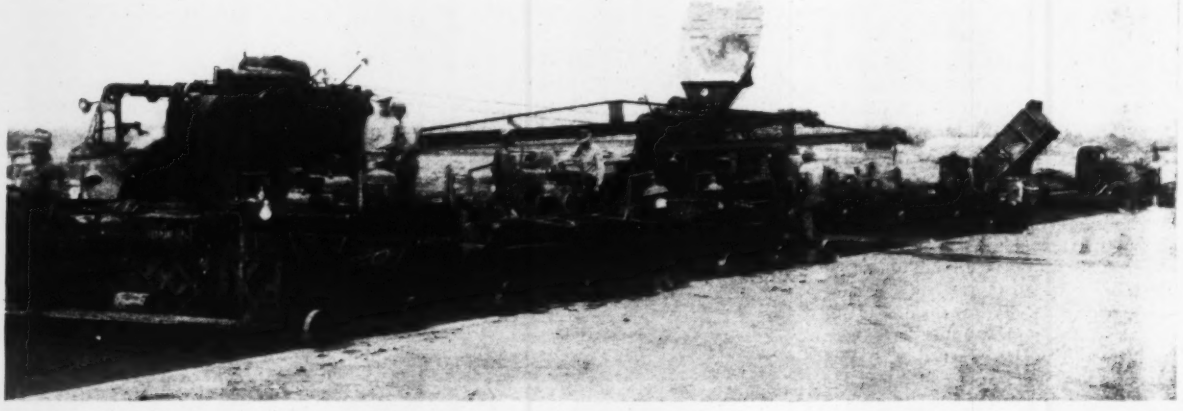
BOSTON AIRPORT—Fill is practically finished and four 7,000-ft. runways have their permanent paving at the $75,000,000 Logan Airport in East Boston. A one-story "Apron Building," to be built in semi-circular curves around three sides of an administration area for access to planes, is partly under contract.

NEW YORK CITY AIRPORTS—The Port of New York Authority, a bi-state agency of New York and New Jersey, took over financing, construction and operation of La Guardia Field and Idlewild in New York City, and will soon take control of the Newark, N. J. airport. Largest of these is New York International Airport, popularly known as Idlewild, where the 12-runway scheme now has been reduced to seven runways, six of which are completed. Major approach roads, hangars and supplemental administration space are being constructed and the port is scheduled for use in July, 2½ years after the planned opening. Experimental sand drains have been installed at La Guardia Field to determine the measures necessary to rehabilitate the sinking eastern end, part of which is now barely above sea level and is flooded by very high tides.

BALTIMORE AIRPORT—Major grading is completed for three runways at Baltimore's $13,000,000 Friend-ship Airport, 9 miles south of the city. Built of noncohesive sand and gravel, special compaction procedures are being use, including a 200-ton rubber-tired super-compactor that is expected to reduce substantially the cost for paving. A $3,000,000 administration building has been approved for construction this year.

LIMESTONE, MAINE—Preliminary work is continuing on an airbase in northeast Maine by being built by the Corps of Engineers. About 2,500,000 cu.yd. of earth is to be moved for a 9,000-ft. runway and appurtenances. Construction this winter includes 370x300-ft. concrete arch hangar to accommodate two B36 planes. Paving will be done next summer. The project is about 20 percent complete.

PATTERSON FIELD, OHIO—An exceptional concentration of paving equipment was used last summer to pave 109 acres, largely a 21-in. thick 10,000x300 ft. run-



Patterson Field, Ohio—Three pavers at a central location mixed concrete for delivery by truck to the subgrade. Two more pavers placed the upper layers of concrete for compaction and finishing by the machines shown.

way and nearly 10,000 ft. of 25 in. thick by 150 ft. taxiway at the army airbase in central Ohio. Five 34-E pavers, a spreader with deep vibrators on the rear, two finishers, a joint machine and a longitudinal screed worked in a single "parade" to complete the paving last fall.

SAN FRANCISCO, CALIF.—About 6,000,000 cu. yd. of fill were placed in 1947 making a total of 14,000,000 cu. yd. placed in recent years on the San Francisco airport, which completed the major grading and included some extra yardage stockpiled for future use. A million dollar paving contract still is under way. Work contemplated for 1948 includes miscellaneous paving, sewers and drains.

CLEVELAND, OHIO—Contracts will be awarded this year for enlarging Cleveland's lakefront airfield by reclaiming an area along Lake Erie. Initially, a 1,100-ft. slag dike will be built about 1,200 ft. off-shore and the area inside filled with 750,000 cu.yd. of material ordinarily wasted from harbor dredging, while another 1,000,000 cu.yd. will be pumped in from the lake. By 1950 two 3,500x150-ft. runways are expected to be in operation.

WATER USE AND CONTROL

COLUMBIA RIVER BASIN is now concentrated on the main irrigation facilities for this million-acre project of the Bureau of Reclamation project. Through June 1947 some $217,000,000 had been expended of an estimated total cost of $610,000,000. Major features under construction in 1947 included **Potholes** and **Long Lake** dams, the 14-mile Main canal and the first sections of the East and West Low canal. Also under construction was the **South Coulee Dam**, which with North Coulee Dam will form the 27-mile long Grand Coulee reservoir. Work is not yet under way on the North Dam, but the 1.6 mile feeder canal that will carry water from the pumping plant at Grand Coulee dam to the reservoir has been partially completed by government forces. At Grand Coulee power plant, installation of the seventh 108,000-kw. generator was completed with the remaining two units in the left power house scheduled for operation in early 1948. Six of the nine units in the right power house are now under contract so that capacity being installed will about double the present 776,000 kw.

The 520-ft. high, **Hungry Horse Dam** moved into the construction stage with start of the diversion tunnel while the main dam, requiring 2,750,000 cu. yd. of concrete, is scheduled to be awarded this spring. This Bureau of Reclamation dam is near Columbia Falls, Mont., on the South Fork of the Flathead River, a tributary of the Columbia. The project, exclusive of irrigation features, is estimated to cost $93,500,000.

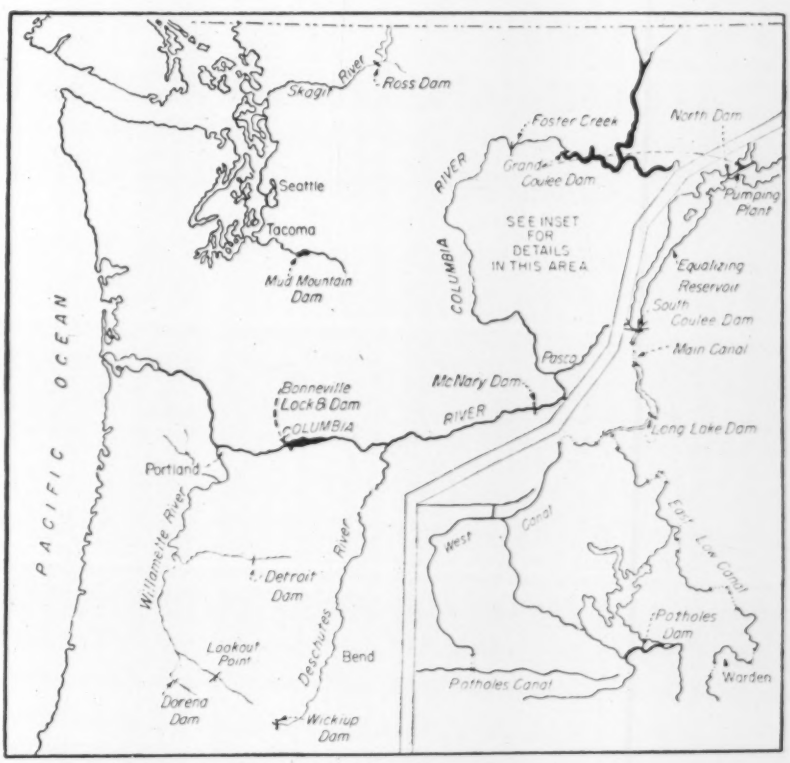
Construction of **Wickiup Dam** on the Deschutes River and a 65-mile canal in central Oregon will provide irrigation water for 50,000 acres. The earth and rockfill dam is 85 percent complete; 43 miles of the main canal were finished and another 12 miles under construction with the final 10 miles scheduled for building this year. The Bureau of Reclamation largest earth fill structure, Anderson Ranch Dam, reached virtual completion in September with 9,078,000 cu. yd. of fill placed. The reservoir will store 500,000 ac. ft. on the South Fork of the Boise River, a tributary of the Snake and Columbia rivers. The dam was built to a height of 300 ft. when halted by the war and has since been raised to 456 ft. The dam is 2,500 ft. thick at the base and has a crest length of 1,100 ft. To date, $18,000,000 has been spent on the project for irrigation and power. Total cost o fthe project, to provide for comprehensive development of southwestern Idaho, may be $25,000,000.

On the main stem of the Columbia River the Corps of Engineers is building the $277,000,000 **McNary** project at Umatilla, Ore. Excavation is under way for the locks and approach channel while the first stage cofferdam is being installed. The lock is 86x675 ft. with a single 92-ft. lift. The spillway section will have 22 gates and the power house will have 14 units totalling 980,000 kw. Earth abutments 4,200 ft. long will make an overall length of 7,500 ft. for the dam. Army Engineers also are investigating the **Foster Creek** site 50 miles downstream from Grand Coulee where a 220 ft. high concrete dam is proposed at a project cost of $172,000,000.

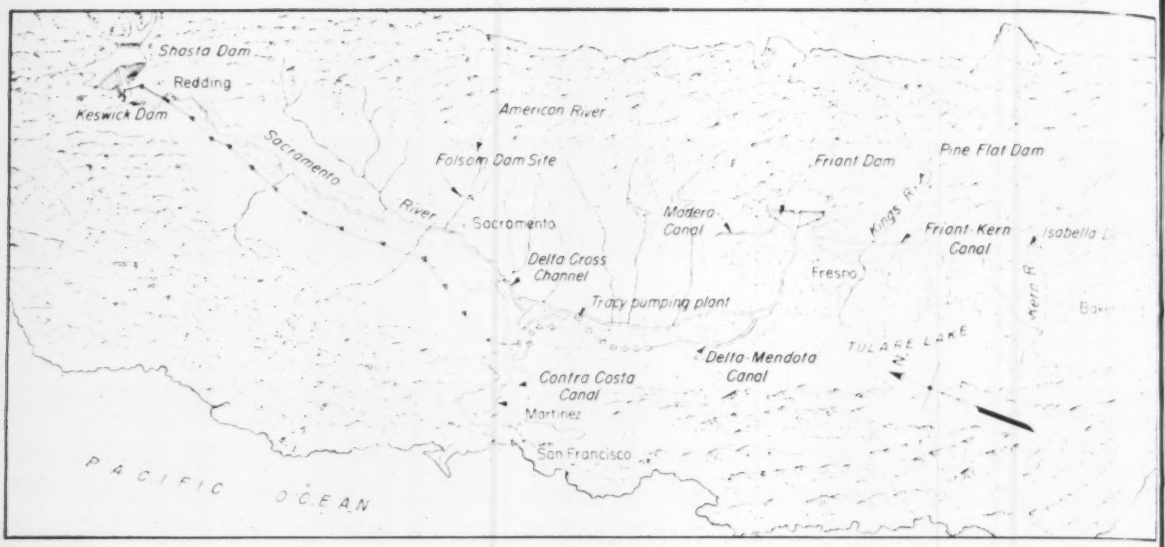
On the Willamette River, a tributary of the lower Columbia, work is in progress at three sites for flood control structures being built under supervision of the Army Engineers. **Dorena Dam**, a 145-ft. high earth-fill structure, is scheduled for completion in November 1949. Some $4,500,000 will be spent this year on the $14,000,000 project. Road relocation and camp facilities are under way preparatory to construction of **Detroit Dam**. The 370-ft. high concrete structure, estimated to cost $46,000,000, is to be started in 1949. Some $4,000,000 will be spent by June for railroad relocation and preliminary work on the $15,000,000 **Lookout Point Dam**. Major construction on this 270-ft. high earth-filled flood control and power project is scheduled to start this summer.

Also in the Pacific northwest, **Mud Mountain Dam**, a Corps of Engineers project, on the White River near Enumclaw, Wash., is about 93 percent complete. It is a rock-fill dam 700 ft. long at crest elevation, and rising 425 ft. above bedrock, estimated to cost $13,285,000. Work remaining is on control and operating equipment and installation of permanent facilities.

Major work on raising the Seattle City Light Department's **Ross Dam** to 540-ft. height was completed late in 1947. Finish work remains to be done in 1948 but, for water storage purposes, the third step construction is usable for its full height. Yet to be undertaken are a powerhouse and transmission lines for Ross Dam.



Columbia basin developments (at right) and other major dams in the Pacific Northwest.



Central Valley of California, site of many major projects under construction for irrigation, power and flood control

Toketee hydro project of California Oregon Power Co., on the North Umpaqua River in Southwest Oregon, will start supplying 27,000 kw., of a total of 40,000 kw. this fall. A dam 60-ft. high, with a 400-ft. long concrete spillway and 700-ft. of earth embankment directs water into 1,600 ft. of 12-ft.-dia. wood stave pipe, 5,600 ft. of concrete-lined tunnel and 1,500 ft. of steel pen-stock for delivery to the powerhouse at a static head of 472 ft.

CENTRAL VALLEY OF CALIFORNIA—Irrigation and power in the Sacramento, San Joaquin and Kern river valleys now planned for central California by the Bureau of Reclamation, will cost more than $400,000,000, about half of which has been expended. Major features include Shasta and Keswick dams and power plants on the Sacramento River near Redding; Friant dam on the San Joaquin near Friant, and some 400 miles of main canals that will eventually bring supplemental or a full supply of water to 2,100,000 acres. Longest of the canals is the 156-mile Friant-Kern, to carry San Joaquin River water from behind Friant dam as far south as the Kern River near Bakersfield. The Delta-Mendota canal will convey Sacramento River water southward from the Tracy pumping plant 120 miles along the San Joaquin, discharging into the river at Mendota, thus providing irrigation water along the lower portion of this river in lieu of that diverted southward by the Friant-Kern and Madera canals at Friant dam.

Some 40,000 cu. yd. of a total of 560,000 cu. yd. in Davis Dam now has been placed including 15,000 cu. yd. in the South Gravity Wall shown. Most of the 3,700,000 cu. yd. of excavation is complete.

The dam and part of the canals are completed. The **Tracy Pumping Plant** is being built under a $6,000,000 contract to provide six pumps, each driven by a 22,500-hp. motor for lifting 4,600 cfs. of water about 200 ft. and discharging it into the Delta-Mendota canal. The first 73 miles of the **Friant-Kern** canal is complete and under construction while a 24-mile section of the **Delta-Mendota** canal is being built. The final section of the 47-mile **Contra Costa** canal is nearing completion to deliver water for irrigation and public use to the **Martinez** reservoir, which was completed in 1947.

At **Shasta Dam** the two 75,000-kw. generators that were loaned to Grand Coulee during the war have been returned and are ready for field testing. A fifth generator is being delivered. The three drum gates that will increase the storage capacity of the reservoir from 3,700,000 acre-ft. to 4,500,000 acre-ft. are being installed.

The Army Corps of Engineers is building several flood control structures and has plans for more. Work was started in 1947 on **Pine Flat Dam,** a flood control and irrigation project on the Kings River. Storage for 1,000,000 acre-ft. is provided at a total cost of $36,000,000. Work is expected to start this year on **Isabella Dam,** a combination flood control and irrigation project on the Kern River where 550,000 acre-ft. of water will be stored at a cost of $12,000,000. Plans are being pushed for the 1,000,000 acre-ft. **Folsom** project for flood control, irrigation and power on the American River.

Pacific Gas and Electric Co. has several hydro projects under construction in the Sierra Nevada: The 99,000-kva **Electra** project with a small diversion dam and 2-mile tunnel will be finished in July; **Crest Dam,** a 120-ft. high, 50,000 cu. yd. gravity structure will provide 75,000 kva in 1949, and **Rock Creek Dam,** 170-ft. high and requiring 150,000 cu. yd. of concrete will start supplying 126,000 kva. in 1950.

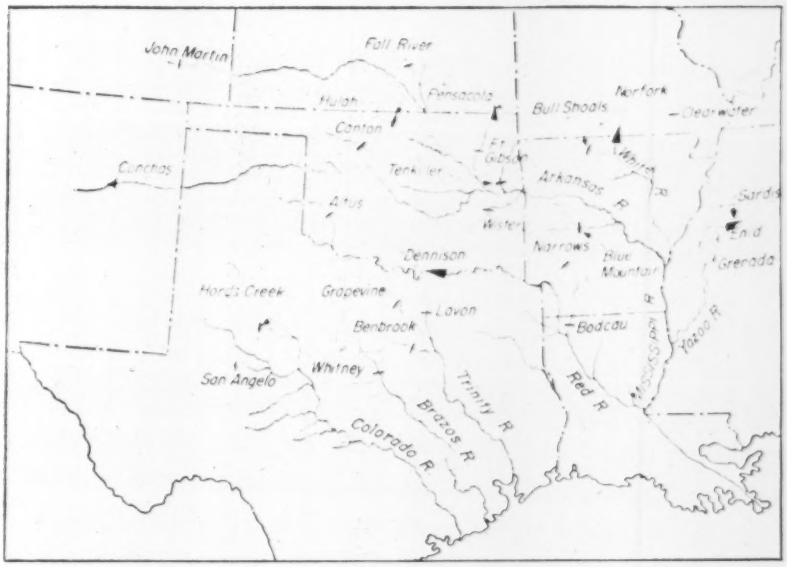
COLORADO RIVER—Most interesting and unusual of all current irrigation developments is the **Colorado-Big Thompson** project on the headwaters of the Colorado River. Water from the Upper Colorado will be stored behind **Granby** and **Shadow Mountain** dams on the western slope of the Rocky Mountains and conveyed under the Continental Divide by the 13-mile **Adams Tunnel** to the eastern slope where it is utilized for power generation and for supplemental irrigation of 615,000 acres in northeastern Colorado. The Adams Tunnel is now complete and in operation. Shadow Mountain Dam is complete and Granby is about half finished. **Green Mountain Dam** on the Blue River on the western slope is completed to store water for release into the Colorado River at low flow in lieu of that diverted through the Adams Tunnel. **Horsetooth Reservoir**, on the eastern side of the mountains to store diverted water, is about one-third finished. Supplemental pumping facilities and smaller dams are under construction. Over $35,000,000 has been spent on the project of an estimated total cost of $132,000,000. For a map and description of the project see *ENR* Dec. 11, 1947, vol. p. 792.

By far the largest structure under way on the Colorado River is the earth and rock fill **Davis Dam** being built 67 miles downstream from Hoover Dam, to create a 1,820,000 acre-ft. reservoir. Water stored will be utilized for power production and for the regulation of flow at the international boundary in accordance with the Mexican water treaty. An extensive foundation grouting program has delayed concreting but the project now is 14 percent complete.

TEXAS RIVERS—Under construction on the Colorado River of Texas are **San Angelo Dam**, an $18,500,000 flood-control project requiring 13,600,000 cu.yd. of rolled fill, which is to be completed in 1951; and **Hords Creek Dam**, to be finished this year at a cost of $2,500,000. On the Brazos River, a bid of $16,000,000 was received for **Whitney Dam**, to be finished by 1952 to provide flood control and power, at a cost of $34,000,000. **Benbrook Dam** on the Trinity River, a $12,400,000 project, was started last year on a four-year schedule. **Grapevine Dam** to cost $12,000,000 and **Lavon Dam** ($12,200,000) are in preliminary stages with completion scheduled for 1951.

MISSISSIPPI AND ITS TRIBUTARIES—Water control and development structures are being built throughout the great Mississippi Valley. Levees, flood walls, mattresses, revetments and channel clearing are under construction, usually in small units, but a very large volume when taken together. The dams, except on the Missouri, are primarily for flood control, but also are planned for power, navigation and irrigation. Most of the projects mentioned are being built under the supervision of the Corps of Engineers of the Army; where other agencies are in charge they are named.

YAZOO BASIN—Supplementing the completed Sardis and Arkabutla Dams in the Yazoo Basin are two new rolled-fill structures: **Grenada Dam** on the Yalobusha was started a year ago. To date 3,100,000 cu. yd. has been excavated and 1,600,000 of fill placed on the 80 ft. high, 14,000 ft. long project that will cost $35,000,000.



Dams now being built in Texas and on tributaries of the lower Mississippi.

Concrete for Fall River Dam on a tributary of the Arkansas River is placed by cableway.

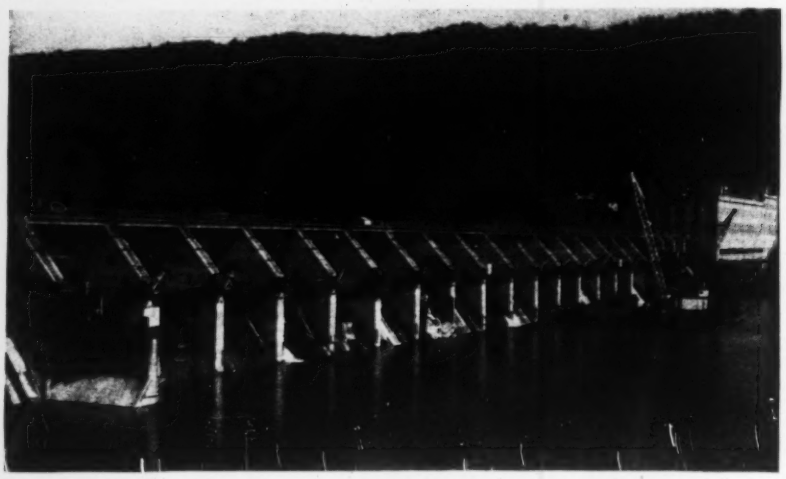
Enid Dam on the Yacona River has the foundation stripped and 1,000,000 cu. yd. of fill placed, with completion scheduled for December 1949.

RED RIVER—The 70 ft. high, 8,400 ft. long rolled-fill **Bodcau Dam** on a tributary northeast of Shreveport is 55 percent complete. At **Dennison Dam**, in operation since 1944, a second 35,000-kw. generating unit is being installed. On the North Fork of the Red River the Bureau of Reclamation's W. C. Austin project (formerly Lugert-Altus) is nearing completion. **Altus Dam** lacks only the spillway control gates and canals will soon be finished. On the Little Missouri River, a tributary of the Ouachita and the Red, **Narrows Dam** is being constructed near Murfreesboro, Ark. Much of the excavation for the concrete gravity dam is completed and a concrete-wall cofferdam enclosing half the river bottom for first stage construction is unwatered. The $12,500,000 project will have two 12,000 hp. turbines for power.

ARKANSAS BASIN—In central Arkansas, **Blue Mountain Dam** on the Petit Jean River, an earth-fill structure 195 ft. high, was completed in June 1947 at a total cost of $5,400,000. **Wister Dam** on the Poteau River, also a rolled fill, will store 130,000 ac. ft. of water. Work at the site is 70 percent complete with the dam scheduled for closure this summer. The project cost is just under $10,000,000. **Tenkiller Ferry Dam** near the mouth of the Illinois River some 40 miles above Fort Smith is just well underway. The 190 ft. high 3,000 ft. long earth fill will back up 1,230,000 ac. ft. of water for flood control and 56,000 kw. of power. Estimated cost is $22,750,000.

Largest dam now under construction in the Arkansas Basin is **Fort Gibson** on the Grand River near Muskogee, Okla. just

Cableways have placed 520,000 cu. yd. of concrete in Wolf Creek Dam on the Cumberland.



Hales Bar Dam, built in 1913 with an uncontrolled spillway, is being raised 3 ft. by adding piers to the old concrete and installing gates.

downstream from the operating Pensacola Reservoir. Some 500,000 cu.yd. of concrete are going into the dam to provide storage for 1,287,000 ac.ft. Initial power installation will be four 12,300 kw. units. The $40,000,000 project is 18 percent complete with major concreting underway. Completion is scheduled for late 1949. **Hulah Dam** on the Caney River, a tributary of the Verdigris, is a 60-ft. high, mile-long rolled fill structure to store 295,000 ac.ft. for flood control. Major part of the embankment and rough excavation of the spillway is finished. Contracts have just been awarded for completion, including ten 40x25-ft. tainter gates. Cost will be $11,000,000; some 15 percent of the total project is completed. **Fall River Dam,** also on a tributary of the Verdigris and some 60 miles east of Wichita is the same type, same storage and cost as Hulah but is 94 ft. high. Construction is about half complete. **Canton Dam,** a rolled-fill structure 68 ft. high and 14,000 ft long, is on the North Canadian River 75 miles northwest of Oklahoma City. Storage is provided for 390,000 ac.ft. of which 240,000 ac.ft. is for flood control and 69,000 ac.ft. for irrigation. The $10,000,000 project is nearly completed and will be used this spring. **John Martin Dam,** a $15,000,000 project on the main stem of the Arkansas in southwestern Colorado is now completed, after war-time delay, except for operating machinery for the 16 spillway-control g[ates].

On the South Canadian River, Co[nchas] Reservoir and 109 miles of canals event[ually] will supply water to 45,000 acres o[f] Bureau of Reclamation's **Tucumcari** [Proj]ect in New Mexico. The dam and 70 [miles] of canal are complete. Twelve mile[s of] canal are under construction and [will] soon will be available to half the pr[oject] area.

WHITE RIVER BASIN—**Bull Shoals Dam** on the White River in north[ern] Arkansas is a half-mile long, 263 ft. h[igh] concrete structure to store 5,400,000 ac.ft. of water for flood control, power and stream regulation. A concrete cofferdam enclosing the left abutment has been completed and excavation is in progress. A 7-mile belt conveyor is being built to move 4,000,000 tons of aggregate to the dam for 2,500,000 cu. yd. of concrete. The project, with three of eight 42,000 kw. power units, will be completed in 1952 at a cost of $70,000,000.

Clearwater Dam on the Black River in southern Missouri—an earth-fill structure, 4,225 ft. long and 143 ft. high with an uncontrolled spillway—will be completed this summer after war-time delay. The 391,000 ac. ft. flood-control project will cost $10,000,000.

MISSOURI RIVER BASIN—Under the Pick-Sloan plan for basin-wide Missouri River control and development, the Corps of Engineers of the U. S. Army and the Bureau of Reclamation of the Department of the Interior have under way a broad program of construction involving many major projects.

CORPS OF ENGINEER PROJECTS—Largest of all current projects in the country is **Garrison Dam** on the Missouri River above Bismark, N. D., which entered the major construction stage in September with award of a $6,350,000 contract for moving 15,000,000 cu.yd. of earth. Much preliminary and access work has been done over the past two years. Administrative and housing facilities for a town of 5,000 are being constructed under a $7,000,000 contract. Some 75,000,000 cu.yd. of rolled fill and 2,000,000 cu.yd. of concrete will go into this $177,000,000 project to store 23,000,000 ac.ft. of water on completion in 1954.

Also on the main stem of the Missouri is **Fort Randall Dam** at the South Dakota-Nebraska line. A $4,400,000 contract for moving 15,000,000 cu.yd. of earth now is under way on this 170 ft. high 10,000-ft. long rolled-fill structure, which is scheduled for completion in 1953 at a cost of $152,000,000.

Flood protection for Denver is to be provided by **Cherry Creek Dam.** An $8,000,000 contract was awarded late in 1947 for the spillway and the 15,000,000 cu.yd. of rolled fill that will go into the 140-ft. high and 14,000-ft. long dam. The project, on a tributary of the Platte, will be completed in 1950 at a cost of $19,500,000. **Kanopolis Dam** on the Smoky Hill River in Kansas will be completed early in 1948 at a cost of $12,000,000. A combination

flood control and irrigation project known as **Harlan County Reservoir** on the Republican River in southern Nebraska will require 9,500,000 cu.yd. of earth and 100,000 cu.yd. of concrete. The contract has just been awarded with completion expected in 1951 at a cost of $11,000,000.

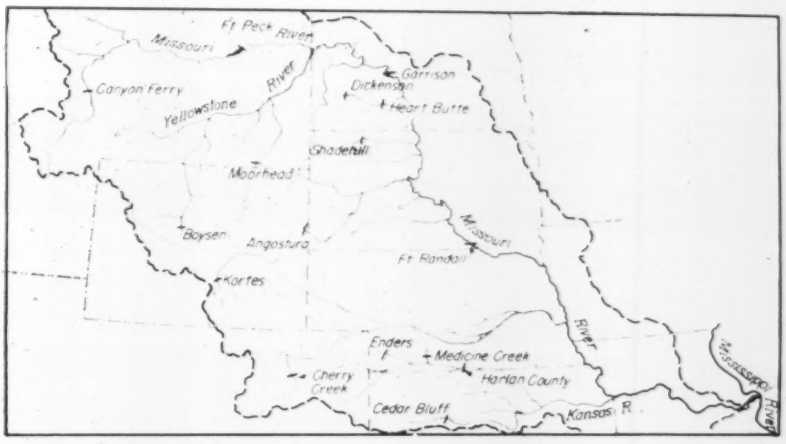
Flood control work in this area also includes the Liberty Bend cutoff project on the Missouri River just below Kansas City, a 9,000-ft. concrete flood wall for protection of Kansas City's industrial district; virtual completion of a 4-mile rock-base levee around the Kansas City municipal airport and other improvements.

BUREAU OF RECLAMATION WORK—Four major dams were under construction by the Bureau of Reclamation during 1947 and two others are just getting under way. Under construction were: **Angostura** on the Cheyenne River, a concrete gravity dam with a height of 150 ft. and a crest length of 1900 ft. It will provide irrigation for 16,000 acres at a cost of $4,200,000. **Kortes** on the North Platte near Casper, Wyo., is a 200-ft. concrete gravity structure primarily for power production and will have three 12,000 kw. generating units installed at a total cost of $4,700,000. **Enders Dam** on Frenchman's Creek near Enders, Neb. is a rolled fill dam about 100 ft. high being built under a $4,000,000 contract. **Boysen Dam** on the Big Horn River in Wyoming got under way during 1947, with major construction bid at $14,000,000. **Medicine Creek Dam** in Nebraska was let in January this year under a $4,270,000 construction contract.

Several other dams on the vast Missouri River development also were scheduled by the Bureau of Reclamatorn for award within the first half of 1948. These include Moorhead, Bixby, Cannon Ball, Dickinson, Keyhole, Shade Hill, Bonny, Culbertson, Narrows and Cedar Bluffs dams. The total estimated cost of the Missouri River projects is $2,132,000,000. Through June, 1947, about $19,000,000 had been spent.

WISCONSIN RIVER—Two hydroelectric projects will be in active construction during 1948 on the Wisconsin River near Necedah, Wis., by the Wisconsin River Power Co., a jointly-owned subsidiary of three utilities. **Petenwell Dam** will start in the spring and work on **Castle Rock** development, downstream from Petenwell, is scheduled for fall. Features of Petenwell and Castle Rock projects are, respectively: head, 42 ft. and 30 ft.; installed capacity, 20,000 kw. and 15,000 kw.; reservoir area, 21,000 acres and 16,500 acres; estimated cost, $7,500,000 and $5,800,000.

OHIO RIVER BASIN—Under the $33,000,000 **Conemaugh** River flood control project, a $6,000,000 contract for grading and bridge substructure, is 90 percent complete at the year end, while a half mile, 32-ft. diameter double-track tunnel is 75 percent complete. Expected to be put under contract soon, the concrete dam will be 137 ft. high and store 274,000 acre-ft. Work is about 80 percent complete on the $28,000,000 **Bluestone** project on West Virginia's New River. The concrete gravity dam is expected to be completed by December. Nearing completion, the 92-ft. high, 3-mile long $7,000,000 **Delaware Dam** on Olentangy River will store 132,000 acre-ft. of water. **Dewey Dam** on Kentucky's Big Sandy River, now one-third complete, will cost about $5,000,000. The **Dillon** reservoir project on Licking River near Zanesville, Ohio, was stopped for lack of funds after railroad relocation was about half completed. Project cost is $14,000,000.



The Bureau of Reclamation and the Corps of Engineers share in planning and construction for $2 billion in water use and control works for the great Missouri Valley.

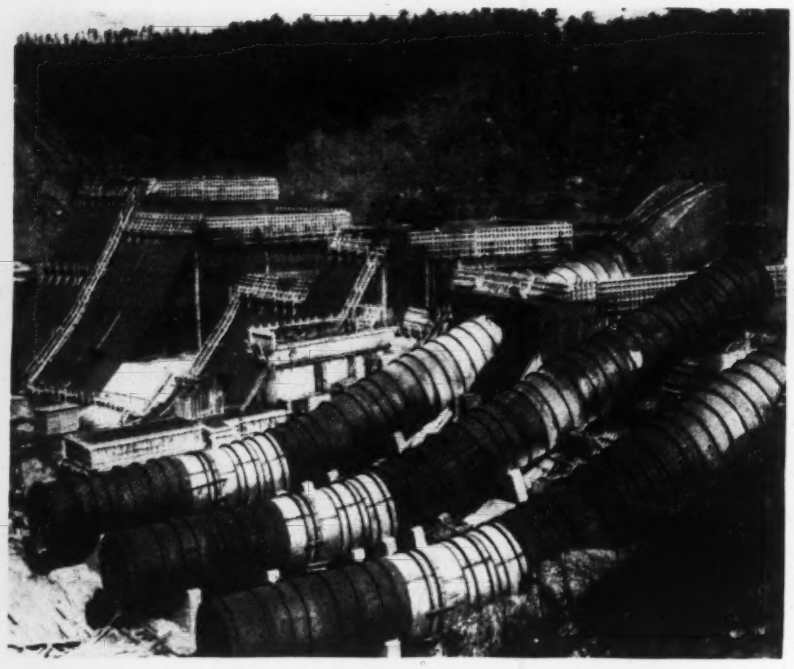
CUMBERLAND BASIN—Three major projects are under way on the Cumberland River and its tributaries: at **Wolf Creek Dam** on the main stream in Kentucky nearly half of the 9,500,000 cu.yd. of rolled earthfill has been placed and a third of the 1,400,000 cu.yd. of concrete. Two cableways are being used to place the concrete, which is mixed in a high plant on the south abutment. The $59,000,000 project will eventually store 6,000,000 acre-ft. of water. **Dale Hollow Dam** on the Obey river was completed in 1943 for storage of 1,700,000 acre-ft. of water; a three-unit power house, with two 18,000 kw. generators, is half completed. Also on the Cumberland watershed is **Center Hill Dam** on the Caney Fork where some 2,000,000 cu.yd. of earthfill and 850,000 cu.yd. of concrete have been placed to bring the structure to 85 percent completion. Two 50,000 kw. generators are on order to utilize part of the 2,000,000-ac.-ft. storage.

Dams under construction in eastern states.

TENNESSEE VALLEY—Major work being done by the Tennessee Valley Authority is construction of two headwater dams and installation of additional facilities at existing main-river dams. At **Watauga**, a 318-ft. high earth and rock fill dam in northeastern Tennessee 600,000 of a total of 1,500,000 cu.yd. of earth is in place with 636,000 of the total of 1,360,000 cu.yd. of rock. One blast with 526,000 lb. of explosives, placed in coyote tunnels, produced 300,000 cu.yd. of rock. Work on nearby **South Holston Dam**, a similar earth and rock fill structure, is being deferred until major equipment from Watauga can be made available. Raising of **Hales Bar Dam**, near Chattanooga, by 3 ft. to provide full navigation depth has reached the gate-setting stage.

Additional generating units have been installed at Wheeler, Fort Loudoun and Kentucky dams, totaling 160,000 kw. while other units for Wilson, Wheeler and Douglas now under contract will add another 190,000 kw.

Allatoona Dam on the headwaters of the Alabama River in North Georgia is one-third complete. About 160,000 of the 500,000 cu.yd. of concrete in the 190-ft. high structure have been placed, using a cableway. Penstocks 20-ft. dia. have been set for 36,000-kw. power units, but only two will be installed now. The second stage cofferdam is now under construction to permit building the north half of the dam for the $20,000,000 project.



Three 20-ft. dia. penstocks have been placed for Allatoona Dam on the Etowah River.

Central Maine Power Co. is continuing work through the winter by pumping heated concrete for construction of its Union Falls Dam on the Sacco River.

Clark Hill Dam on the Savannah River above Augusta, Ga., has reached the unwatering stage for the first river cofferdam. Supplemental work, such as access railroads and highways have been let in small units and is now well advanced. The major construction contract is $26,500,000.

Buggs Island Dam preliminary work has been contracted in small units. Excavation within the first cofferdam is well along in preparation for a main dam of concrete with a length of 2,785 ft. and a maximum height of 144 ft. The concrete will be flanked by 19,600 ft. of rolled earth fill. Award of the main dam construction has been held up as low bid received in January was $15,800,000 compared to an engineer's estimate of $11,700,000. The entire project for flood control, navigation and power is expected to cost $69,000,000.

SUSQUEHANNA RIVER BASIN — Two dams and important flood control work are under way on the upper Susquehanna watershed. **Sidney Dam** is a concrete gravity and earthfill structure 2,000 ft. long and 123 ft. high. Now 19 percent complete, the project is expected to cost about $6,000,000. **Almond Dam** near Hornell, N. Y., is a rolled fill structure 1,350 ft. long and 90 ft. high with a concrete spillway and outlet conduit. The $5,250,000 project is now 48 percent complete.

Union Falls Dam on the Sacco River near Brunswick, Me., is a 75-ft. head power development for the Central Maine Power Co. A 55,000 cu. yd. concrete dam across the channel and a 600,000 cu. yd. earthfill make up the structure. Concreting is continuing on full schedule through the winter with installation of two 12,000-kw. power units to be completed in 1949.

Union Village Dam on a tributary of the Connecticut River in central Vermont is a flood control structure, 170 ft. high and 1,100 ft. long. Construction is about half completed under a $3,200,000 contract.

Mt. Morris Dam, a flood control structure, on the Genesee River near Rochester, N. Y., has just been started with award of a $20,200,000 contract. Principal quantities are 470,000 cu. yd. of earth excavation and 200,000 cu. yd. of rock with 755,000 cu. yd. of concrete to be placed on a 4-yr. construction schedule.

ONTARIO HYDRO—The Hydro-Electric Power Commission of Ontario has added a second 70,000 hp. unit to its **DeCrew Falls** plant in the Niagara system, which with other improvement to increase the head from 265 to 280 ft. cost $7,700,000. At **Stewartville** on the Madawaska River in the Ottawa River basin it is building a plant to develop 150 ft. of head in three 27,000 hp. units. Work began in the fall of 1945 and will be completed late this year at a cost of $10,500,000. Also in the Ottawa valley, on the main river, preliminary work has begun on the **Des Joachims** development, 136 miles above Ottawa, which will have an initial installation of 360,000 hp. in six units under a head of 130 ft., estimated to cost $51,000,000. Ultimate capacity of this project is 480,000 hp. In Northern Ontario work was begun in 1946 on a project on the **Aguasabon River** on the north shore of Lake Superior where 290 ft. of head will be developed in two units of 26,500 hp. served by a unique pressure conduit consisting of a tunnel driven under the storage reservoir to a vertical intake shaft rising to the reservoir surface. The project will cost $10,000,000 and is expected to be completed this year. Preliminary work also has been started on a 58,000 hp. project on the Mississagi River, 53 miles east of Sault Ste. Marie, which with a storage reservoir 40 miles upstream is to cost $19,000,000.

QUEBEC POWER—Construction of a new power plant on the St. Maurice River at **Shawinigan Falls**, Que., was begun late in 1946 by the Shawigan Water & Power Co. and it is expected that the first unit will go into operation this year. The plant will contain three 65,000-hp. units under a head of 145 ft. and will cost $12,500,000.

SOUTH SASKATCHEWAN RIVER—Construction of a combined irrigation and power project estimated to cost $66,000,000 and to require 12 years of work was begun during the year on the South Saskatchewan River in Saskatchewan by the Canadian government. The initial work includes an earth-fill dam to form a reservoir of 6,765,000 acre-ft. capacity. Ultimately 119,500 hp. is to be installed.

UNIT PRICES BID BY CONTRACTORS

Dupont Circle Underpass, Washington, D. C.

OWNER: District of Columbia Highway Department; H. C. Whitehurst, director.

PROJECT: Construction of the Dupont Circle Underpass on Connecticut Avenue, between R and N Streets, N.W., Washington, D. C. Work comprises two separate and adjacent underpasses, one consisting of a streetcar underpass, and the other, of a combined vehicular traffic underpass and depressed roadway. The elevation of the low points of the tunnels will be approximately 20 ft. below the present grade. To bypass the active construction stages, vehicular traffic will be maintained by a series of belt detours.

CONDITIONS: All materials are to be furnished by the contractor. Minimum wage rates specified per hr. are: bricklayers, $2.375; carpenters, $2.15; cement finishers, $1.97; electricians, $2.25; structural iron workers, $2.40; drivers of dump trucks, up to and including 8 wheels, $1.00; drivers of trucks over 8 wheels, $1.25; and laborers, $1.20.

BIDS: Four bids were received, ranging from the contract low of $3,951,485.00 to $4,437,986.00. Contract was awarded November 28, 1947.

LIST OF BIDDERS:

1. John McShain, Inc., Bethesda, Md. (contract) $3,951,485.00
2. Poirer & McLane Corp., Washington, D. C. 4,184,030.00
3. Chas. H. Tompkins Co., Washington, D. C. 4,288,775.00
4. The Tuller Const. Co., Red Bank, N. J. 4,437,986.00

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Ordinary excavation, except in grading, including all backfill and disposal	123,000 cy	$7.37	$9.50	$9.00
2	Rock excavation, including disposal	500 cy	73.80	20.00	20.00
3	Grading (between completed walls)	22,000 cy	2.50	9.50	2.00
4	Concrete, Class BB, in place	24,500 cy	40.50	40.00	45.00
5	Concrete, Class BB, in waterproofing protection, in place	120,000 sf	0.425	0.40	0.50
6	Concrete, Class X, light weight, for fill, in place	2,250 cy	32.70	25.00	25.00
7	Reinforcing steel, in place	2,080,000 lb	0.0673	0.12	0.09
8	Structural steel, in place	3,400,000 lb	0.105	0.10	0.13
9	Wrought iron, in place	36,450 lb	1.62	1.20	1.50
10	Sawn granite, 4" thick, in place	40,900 sf	6.50	6.00	7.50
11	Cut granite, in place	10,500 cf	19.00	20.00	20.00
12	Terra cotta tile, 4" in waterproofing protection, in place	131,000 sf	0.47	0.50	0.70
13	Ceramic tile facing, in place	45,200 sf	1.85	2.00	1.60
14	Membrane waterproofing, 3 ply in place	30,000 sy	2.45	2.50	2.00
15	Dampproofing, in place	1,250 sy	1.50	1.00	1.00
16	Structural railing, in place	3,200 lf	17.00	20.00	15.00
17	Wrought iron railing at stairwells, in place	490 lf	11.00	15.00	10.00
18	Wrought iron railing in stairways in place	1,660 lf	4.00	6.00	3.50
19	Lamp posts, in railing and on center wall, as shown on the plan in place	47 ea	250.00	220.00	2.50
20	Lamp posts, at stairwells, as shown on the plans in place	16 ea	150.00	130.00	170.00
21	Perforated clay drain pipe, in place—8"	6,000 lf	9.25	5.00	3.00
22	Cast iron drain pipe, in place—6"	500 lf	15.50	8.00	8.00
23	Cast iron drain pipe, in place—8"	370 lf	26.00	10.00	14.00
24	Cast iron drain pipe, in place—12"	2,800 lf	45.20	25.00	40.00
25	Cast iron drain pipe, in place—16"	3,200 lf	48.00	20.00	15.00
26	Cast iron drain pipe, in place—18"	100 lf	86.00	50.00	130.00
27	Sewer brick masonry, in manholes, in place	65 cy	85.00	100.00	150.00
28	Manhole frames and coves, in place	28 ea	40.00	50.00	60.00
29	Cast iron inlet frames and gratings for catch basins in transit tube, in place	6 ea	200.00	50.00	100.00
30	Cast iron inlet frames and gratings for catch basins in vehicular underpass, in place	12 ea	150.00	120.00	350.00
31	Light fixtures in transit tubes, in place	238 ea	14.00	10.00	20.00
32	Light fixtures in transit stations, in place	110 ea	90.00	100.00	100.00
33	Vehicular tunnel lighting fixtures, in place	163 ea	100.00	100.00	110.00
34	Conduit, exposed, in transit tubes, in place	6,900 lf	1.00	1.00	1.50
35	Conduit, concealed, in transit station, in place	6,300 lf	1.00	1.20	1.50
36	Conduit, in vehicular underpass, in place	7,850 lf	0.70	0.80	1.00
37	Pilot light boxes, in place	2 ea	160.00	100.00	100.00
38	Ventilating fans, in place	8 ea	1,100.00	1,000.00	1,250.00
39	Ventilating grills, in place	8 ea	150.00	100.00	125.00
40	Ventilating hoods, in place	8 ea	800.00	300.00	1,000.00
41	Carbon monoxide analyzers, complete in place	4 ea	2,500.00	2,500.00	2,500.00
42	Furnishing and installing air sampling system in Dupont Circle vehicular underpass, complete in place	lump sum	3,100.00	2,000.00	3,000.00
43	Electrical installation for ventilating and lighting Dupont Circle vehicular underpass, complete in place	lump sum	7,100.00	6,000.00	10,000.00
44	Electrical installation for lighting of transit tubes and stations, complete in place	lump sum	7,200.00	6,000.00	10,000.00
45	Miscellaneous metal, complete in place	lump sum	12,000.00	10,000.00	10,000.00
46	Furnishing and installing water system for the Dupont Circle vehicular underpass, complete in place	lump sum	2,300.00	1,000.00	2,000.00
47	Furnishing and installing water system for the transit tubes and stations, complete in place	lump sum	700.00	500.00	1,000.00
48	Plumbing system in transit station lavoratory, complete in place	lump sum	5,900.00	3,000.00	10,000.00
49	Removal, storage and replacement of the fountain in Dupont Circle	lump sum	23,000.00	10,000.00	32,000.00
50	Furnishing temporary support of utilities during construction of the project	lump sum	6,500.00	1,000.00	25,000.00

Surfacing State Highway, California

OWNER: State Division of Highways, Sacramento, California; G. T. McCoy, state highway engineer.

PROJECT: Construction of state highway, about 6.6 miles in length, on Route 2, Sections E, SLO, between Miles Station and March St. in San Luis Obispo County, California. Work includes grading and surfacing with plant-mixed surfacing on crusher-run base.

CONDITIONS: Owner to furnish brass plates for center line monuments. Access to job site is available by both rail and highway. Work to begin 15 days after signing contract. Stipulated wage rates are: skilled labor, not less than $1.50 per hr.; semi-skilled, not less than $1.40 per hr.; and common, not less than $1.35 per hr.

BIDS: Eleven bids were received, ranging from the contract low of $1,338,523.65 to $1,681,227.30. Contract was awarded November 11, 1947.

LIST OF BIDDERS:

1. Fredricksen & Kasler, Sacramento, Calif. (contract) $1,338,523.65
2. N. M. Ball & Sons & Madonna Const. Co., Berkeley, Calif. 1,363,591.50
3. Bressi & Bevanda Constructors, Inc., Los Angeles, Calif. 1,374,526.65
4. Morrison-Knudsen Co., Inc., San Francisco, Calif. 1,403,791.75
5. Peter Kiewit Sons Co., Arcadia, Calif. 1,411,457.95
6. Winston Bros. Co., Azusa, Calif. 1,468,650.50
7. Guy F. Atkinson Co., South San Francisco, Calif. 1,491,628.75
8. A. Teichert & Son, Inc., Sacramento, Calif. 1,495,795.00
9. Fredrickson & Watson Const. Co., Oakland, Calif. 1,572,714.60
10. Macco Corp., Clearwater, Calif. 1,644,677.05
11. J. E. Haddock, Ltd., Pasadena, Calif. 1,681,227.30

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Clearing and grubbing	346 sta	$33.00	$100.00	$46.00
2	Removing concrete	1,865 cy	5.00	6.00	4.00
3	Roadway excavation	553,000 cy	.48	.45	.43

Continued on page 164

Surfacing State Highway, California

Continued from page 163

4	Structure excavation	8,760 cy	3.00	4.00	2.85
5	Ditch & channel excavation	2,250 cy	2.00	1.75	1.15
6	Imported borrow, Type A	139,830 ton	.65	.90	.63
7	Imported borrow, Type B	76,000 ton	.52	.55	.52
8	Overhaul	14,900,000 sta y	.005	.003	.0025
9	Placing selected rock fill	14,000 cy	1.00	.87	.58
10	Compacting original ground	47,000 sy	.16	.05	.05
11	Preparing slopes (slope erosion prot.)	72,500 sy	.075	.08	.28
12	Ice plant cuttings	350,000 ea	.04	.03	.045
13	Dev. wat. sup. &furn, wat. equip.	lump sum	9,700.00	12,000.00	6,000.00
14	Applying water	27,000 M ga	1.00	1.45	1.15
15	Finishing roadway	346 sta	20.00	20.00	12.00
16	Crusher run base	56,100 ton	2.35	2.40	2.30
17	Liquid asphalt, SC-2 (pr. ct. & pen. tr.)	435 ton	18.00	20.00	18.40
18	Asphaltic emulsion (sl. ct. & pt. bdr.)	165 ton	28.00	28.00	34.50
19	Screenings (sl. ct.)	1,400 ton	5.50	5.70	5.75
20	Paving asphalt (P. M. S., Type A)	1,840 ton	17.00	16.00	18.40
21	Mineral aggregate (P. M. S., Type A)	33,450 ton	3.85	4.20	5.30
22	Liquid asphalt SC-5 or 6 (P. M. S., Type B)	910 ton	17.00	16.00	18.40
23	Mineral aggregate (P. M. S., Type B)	16,500 ton	3.85	4.20	5.30
24	Placing P. M. S. (ditches & slope drains)	1,900 sf	.25	.12	.28
25	Raised bars	1,100 lf	1.00	.70	1.15
26	Douglas fir timber	6.5 Mf bm	300.00	250.00	225.00
27	Class "A" P. C. C. (structures)	2,200 cy	53.50	46.00	57.50
28	Class "A" P. C. C. (footing blocks)	290 cy	35.00	35.00	46.00
29	Furn. bar reinf. steel	260,500 lb	.075	.07	.07
30	Placing bar reinf. steel	260,500 lb	.03	.025	.05
31	Furn. structural steel	217,000 lb	.10	.09	.09
32	Erecting structural steel	217,000 lb	.04	.035	.07
33	Steel railing	337 lf	10.00	8.50	8.00
34	Furn. treated Douglas fir piling	380 lf	1.50	1.50	2.30
35	Driving timber piles	10 ea	55.00	60.00	175.00
36	Furn. steel piling	4,600 lf	2.30	2.60	2.45
37	Driving steel piles	184 ea	36.00	40.00	70.00
38	Steel angles (curb inlets)	250 lb	.50	.60	.55
39	Cast steel frames & covers for drop inlets	2 ea	65.00	70.00	80.00
40	Sacked concrete riprap	860 cy	31.00	22.00	25.30
41	Class "A" P. C. C. (slope paving)	30 cy	35.00	35.00	34.50
42	Class "A" P. C. C. (curbs & sidewalks)	370 cy	38.00	30.00	40.00
43	Right of way monuments	105 ea	5.00	6.00	5.00
44	Center line monuments	40 ea	5.00	20.00	11.50
45	Metal plate guard railing	8,630 lf	2.90	2.55	2.60
46	Culvert markers & guide posts	390 ea	5.00	5.00	5.75
47	Access opening markers	90 ea	6.00	10.50	9.00
48	New property fence	9.2 mi	1,100.00	1,400.00	1,200.00
49	Drive gates	33 ea	60.00	45.00	45.00
50	Red reflectors	27 ea	2.00	4.00	3.50
51	R. C. P.—18"	2,015 lf	4.15	4.00	5.25
52	R. C. P.—24"	2,310 lf	5.90	6.00	6.25
53	R. C. P.—30"	576 lf	7.40	7.50	7.50
54	R. C. P.—36"	730 lf	10.50	11.00	10.35
55	Spillway assemblies	44 ea	25.00	25.00	30.00
56	C. M. P. downdrains (16gal.)—8"	550 lf	1.80	1.75	2.25
57	Bank protection fence	850 lf	10.00	8.00	5.75
58	Demolishing buildings and appurtenances	lump sum	1,900.00	12,500.00	3,500.00
59	Removing existing bridge	lump sum	500.00	1,000.00	1,700.00

Highway and Railroad Bridges, Newark, New Jersey

OWNER: State Highway Department, Trenton, New Jersey; Morris Goodkind, engineer.

PROJECT: Construction of three longitudinal steel beam deck bridges on Route 25, Section 34, in Newark, Essex County, New Jersey. Two bridges, the Magazine St. Bridge and the St. Charles Ct. Bridge are highway bridges, having concrete foundations, and the third, a railroad bridge, spanning the Central Railroad of New Jersey, has a foundation of concrete on timber piles. Both highway bridges measure 63 ft. long, 73 ft. wide and have roadway widths of 30 ft. and 35 ft. The railroad bridge measures 67 ft. 8 in. wide, and has roadway widths of 29 ft. and 30 ft.

CONDITIONS: All materials are to be furnished by contractor. Stipulated contract time is 150 working days from December 1, 1947. Access to job site is available by rail, water and highway. Prevailing wage rates are: skilled, $2.50 per hr.; semi-skilled, $2.125 per hr.; and common, $1.50 per hr.

BIDS: Seven bids were received, ranging from the contract low of $523,957.00 to $631,647.00. Contract was awarded October 29, 1947.

LIST OF BIDDERS:

1. Poirier & McLane Corp., New York, N. Y. (contract) $523,957.00
2. James Mitchell, Inc., Jersey City, N. J. 536,701.50
3. Union Bldg. & Const. Corp., Passaic, N. J. 547,808.00
4. El-Dorer Contracting Co., Irvington, N. J. 584,162.25
5. Kolyn Const. Co., Trenton, N. J. 607,542.30
6. Ole Hansen & Sons, Inc., Pleasantville, N. J. 619,209.25
7. Franklin Contracting Co., Newark, N. J. 631,647.00

	Item	Quantity	Unit Prices (1)	(2)
1	Foundation excavation	3,785 cy	$10.00	$14.00
2	Class B concrete in structures	760 cy	60.00	70.00
3	Class C concrete in structures	4,360 cy	50.00	42.00
4	Concrete parapet	497 lf	7.00	10.00
5	Reinforcing steel in structures	299,600 lb	.14	.12
6	Structural steel	1,205,000 lb	.10	.11
7	Wrought iron blast plates	88,000 lb	.18	.22
8	Treated timber piles	1,460 lf	1.50	4.00
9	Waterproofing	3,150 sf	.50	1.50
10	Pipe railing	497 lf	7.00	8.50
11	Clearing site at Magazine St	lump sum	9,000.00	9,000.00
12	Clearing site at St. Charles St	lump sum	9,000.00	9,000.00
13	Clearing site at C. R. R. of N. J.	lump sum	9,000.00	14,570.00
14	Conduit system at Magazine St	lump sum	1,000.00	1,300.00
15	Conduit system at St. Charles St	lump sum	1,000.00	1,300.00
16	Conduit system at C. R. R. of N. J.	lump sum	1,000.00	1,200.00
17	Relocating waterline and hydrant	lump sum	500.00	900.00
18	Field office	lump sum	3,000.00	2,500.00

Racine Street Bridge, Janesville, Wisconsin

OWNER: State Highway Commission of Wisconsin; C. H. Kirch, bridge engineer.

PROJECT: Construction of a 4-span Racine Street Bridge with a 30-foot roadway in the city of Janesville, Rock County, Wisconsin. Bridge is of continuous I-beam construction and measures 274 feet overall in length. Work involves removing old bridge, constructing and paving two 7-foot sidewalks, and installing lighting system.

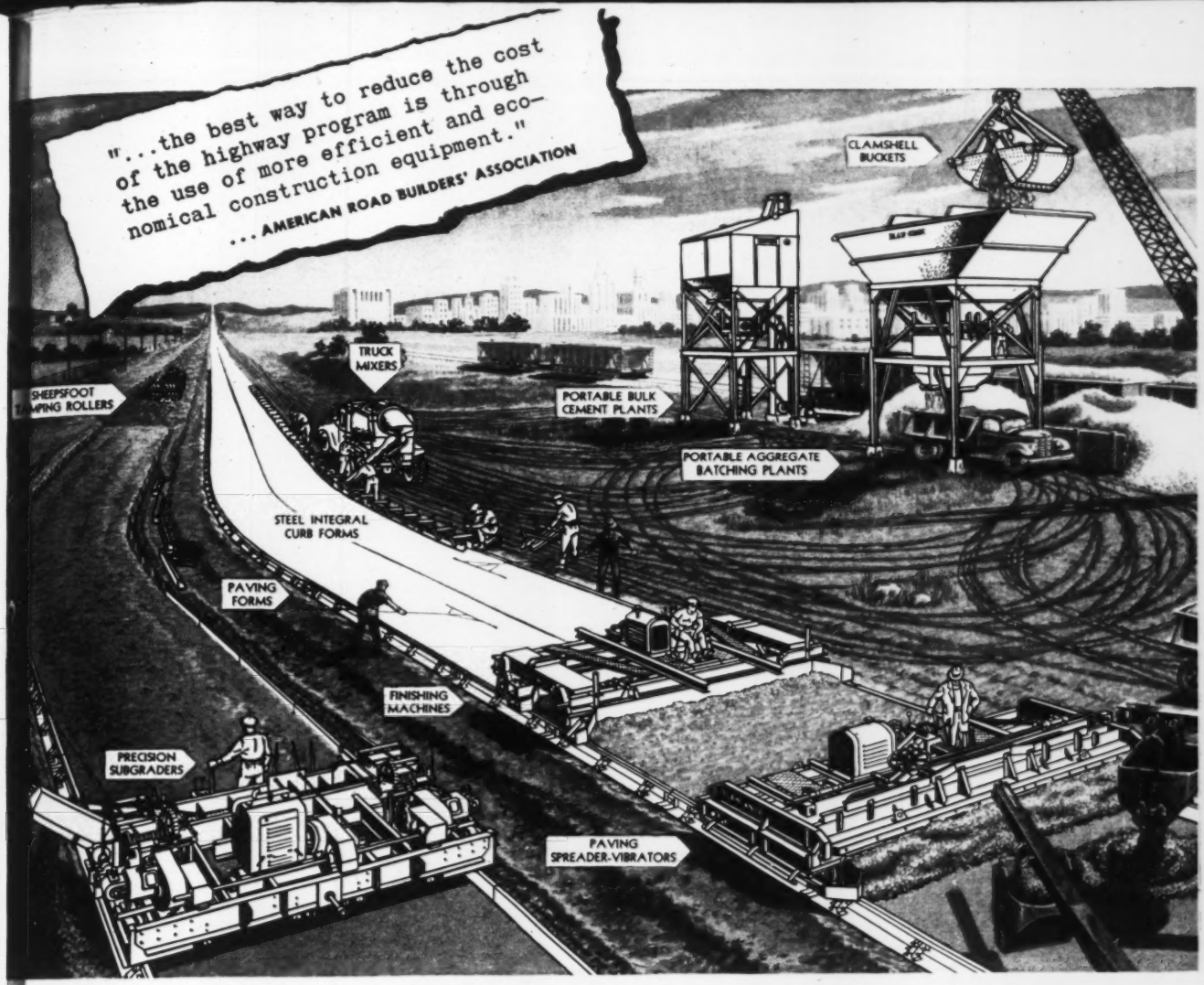
CONDITIONS: All materials are to be furnished by contractor. Access to job site is available by both rail and highway. Stipulated contract time is 310 days. Prevailing skilled labor wage rate ranges from $1.40 to $1.75 per hr.; semi-skilled, from $1.10 to $2.00 per hr.; and common wage rate is $1.10 per hr.

BIDS: Two bids were received, the contract low of $166,281.50 and $167,380.23. Contract was awarded about November 10, 1947.

LIST OF BIDDERS:

1. La Crosse Dredging Corp., Chicago, Ill. (contract) $166,281.50
2. L. G. Arnold, Inc., Eau Claire, Wis. 167,380.23

	Item	Quantity	Unit Prices	(2)
1	Removing old bridge	lump sum	$7,750.00	$12,500.00
2	Excavation for structure	880 cy	25.00	23.25
3	Sand-gravel fill	445 cy	2.00	2.00
4	Coner. masonry, grade "AA"	918.1 cy	50.00	48.50
5	Coner. masonry, grade "X"	147.6 cy	100.00	132.50
6	Bar steel reinforcing	72,270 lb	0.10	0.10
7	Steel fabric reinforcing	330 sy	1.00	0.50
8	Structural steel	337,050 lb	0.15	0.1375
9	Sheet lead	564 lb	0.50	0.35
10	Untr. timber test piling	lump sum	1,500.00	600.00
11	Untr. timber piling	3,260 lf	1.50	1.50
12	Floor drains	20 ea	40.00	35.00
13	Welded struct. steel bearings	11,780 lb	0.50	0.47
14	Lighting system	lump sum	4,000.00	4,250.00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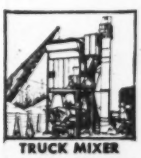
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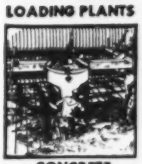
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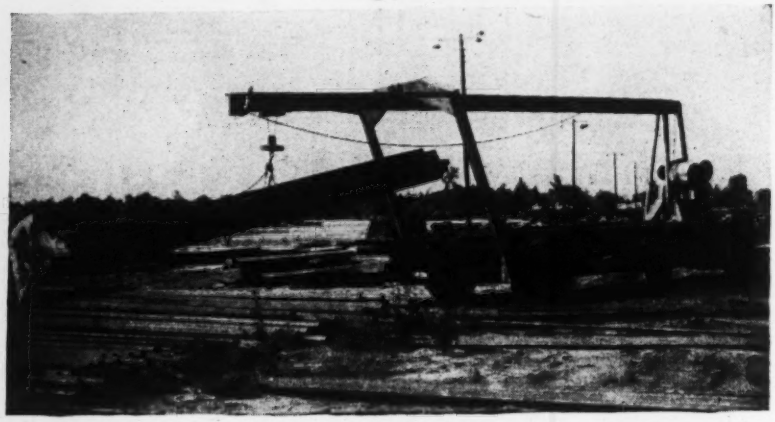
84



ELECTRICALLY - POWERED HAULER—This new rig mounted on large rubber tires has the power and traction to negotiate almost any type of rough going, with loaded capacities ranging from 20 to 100 tons. It is engineered for both long and short hauls. Its construction permits its getting into areas inaccessible to conventional-type trucks and trailers—especially in off-road operations. Equipped with a new type of differential, greater traction is obtained since the drive wheel having the greater traction pulls several times harder than the other, and most power is applied to whichever wheel is on firmer footing. Several variations of the new equipment may be made to meet individual requirements of the hauling contractor.—*Tournalayer Sales Division, R. G. LeTourneau, Inc., Longview, Tex.*

85

RED CONCRETE COLOR—A new brilliant red color for concrete floors, roads or blocks is announced by this maker of concrete colors and chemicals for concrete. One bag of the color is used to one bag of portland cement for a solid brilliant color.—*Reardon Industries, 2,837 Stanton Ave., Walnut Hills, Cincinnati 6, Ohio.*

86

LIGHTWEIGHT PUMPS — Faster automatic priming results from the perfection of a new principle in this company's line of lightweight, centrifugal, self-priming pumps, which are classified as general utility pumps for use in any field where easily transportable and powerful pumps are needed.—*Gorman-Rupp Co., Mansfield, Ohio.*

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87

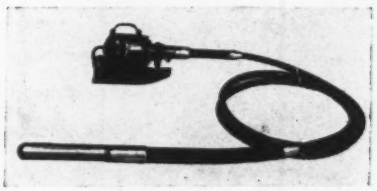
MASONRY WATER REPELLENT—"Rainchek" is a colorless water repellent that penetrates into cement blocks, concrete, brick, tile and stucco to give permanent protection against moisture and water. It guards against water seepage and tends to keep outside walls from becoming discolored from rain or ground moisture. The maker also claims it controls dusting of cement floors by binding together the many tiny loose particles. *Protection Products Mfg. Co., Kalamazoo, Mich.*

88

FLOOR SEALER AND WOOD FINISH—Penetrating deeply into the wood of a floor, this new sealer is said to leave no surface film to be worn away by traffic, sealing up all pores so that dust, dirt and grime cannot seep through or be ground in. It produces a smooth but non-slippery finish on any type of wood floor.—*Vita-Var Corp., Newark, N. J.*

89

CONCRETE VIBRATOR—A vibrator with 13,000 vibrations a minute is now on the market. The high frequency is made possible by a non-eccentric rotor principle. The shaft speed is 3,200 rpm. The flexible shaft can be lubricated in less than 20 seconds, while the vibrator head is not



lubricated. No periodic stripping down is needed and the vibrator is designed and built for long continued uninterrupted work periods. A 1-cylinder gasoline engine, a single or 3-phase electric motor, or a pneumatic motor can power the unit.—*Vibro-Plus Corp., 243 West 55th St., New York, N. Y.*

90

UNION BONNET GATE VALVE—Incorporating what is said to be the first application of full cylindrical body sections to bronze gate valves, a new valve provides maximum dis-

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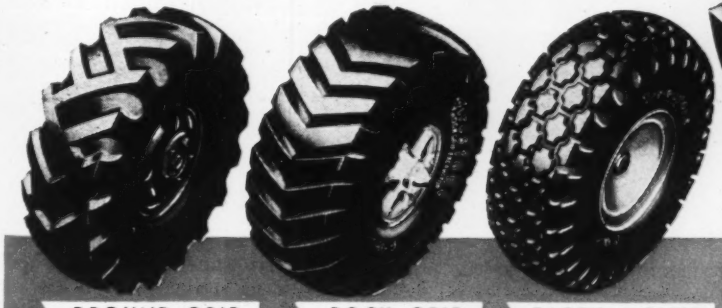

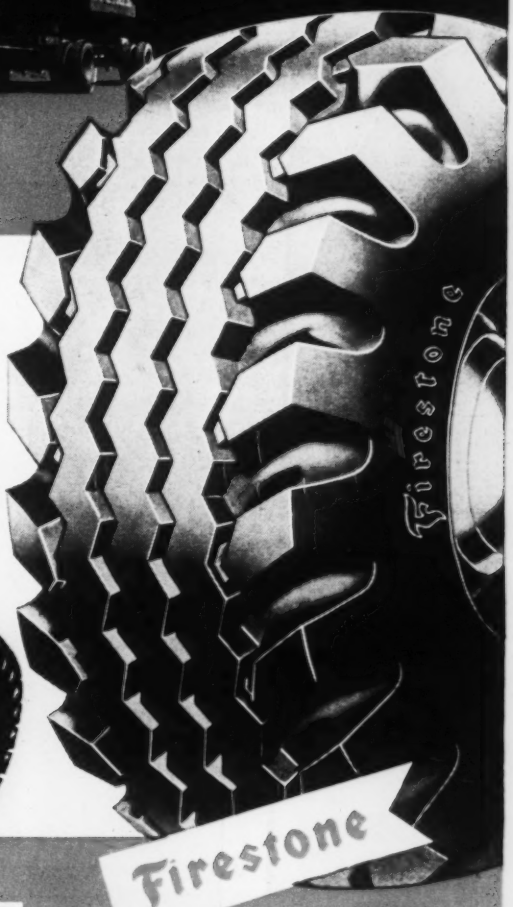

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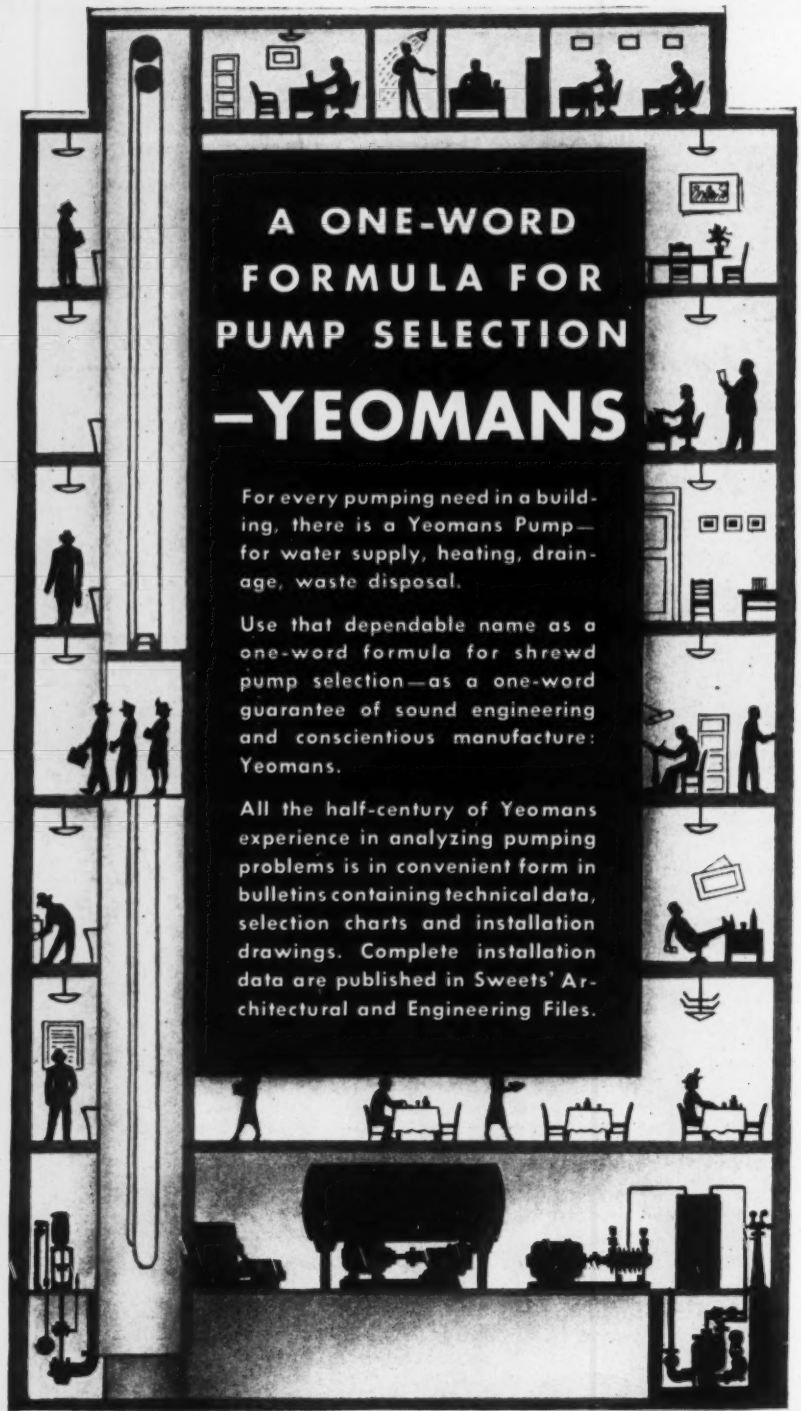
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tortion resistance. Manufacturer lists these features: A silicon alloy stem material which eliminates stem-thread failures; hexagonal head gland; beveled disc wing guides and body guide channels to make assembly easy when servicing the valve.—*The Lunkenheimer Co., Cincinnati* 14, *Ohio.*

91

BLAST HOLE DRILL—The Quarrymaster is a self-contained, self-propelled piston type drill for 6-in. dia. blast-holes. The rig is an assembly of tried I-R parts: A 500-cu. ft. two-stage compressor powers six air motors that are used to travel the rig at 1 mph. and to handle all operations in connection with drilling. The piston drill, using about 300 cu. ft. of air, is based on steam-powered drills, common up to 1900 and since used for large submarine drills. It strikes 200 blows per

min. turning the bit with every stroke and using exhaust air to blow out the dust so the bit always hits on a clean surface. Drilling is said to be two to four times faster than with conventional drills. Separate air motors drive each crawler, a chain feed for the hammer, a hydraulic pump for positioning jacks, a dust collector and a hoist for handling steel. Photo shows mast being raised to drilling position.—*Ingersoll-Rand Co.,* 11 *Broadway, New York* 4, *New York.*

92

WELDING TORCH HOLDER—C&H straight line cutter holds torch and feeds it along straight line. It has adjustable holder so torch can be angled to cut bevel or scarf and positive feed

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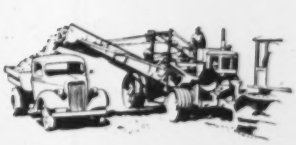

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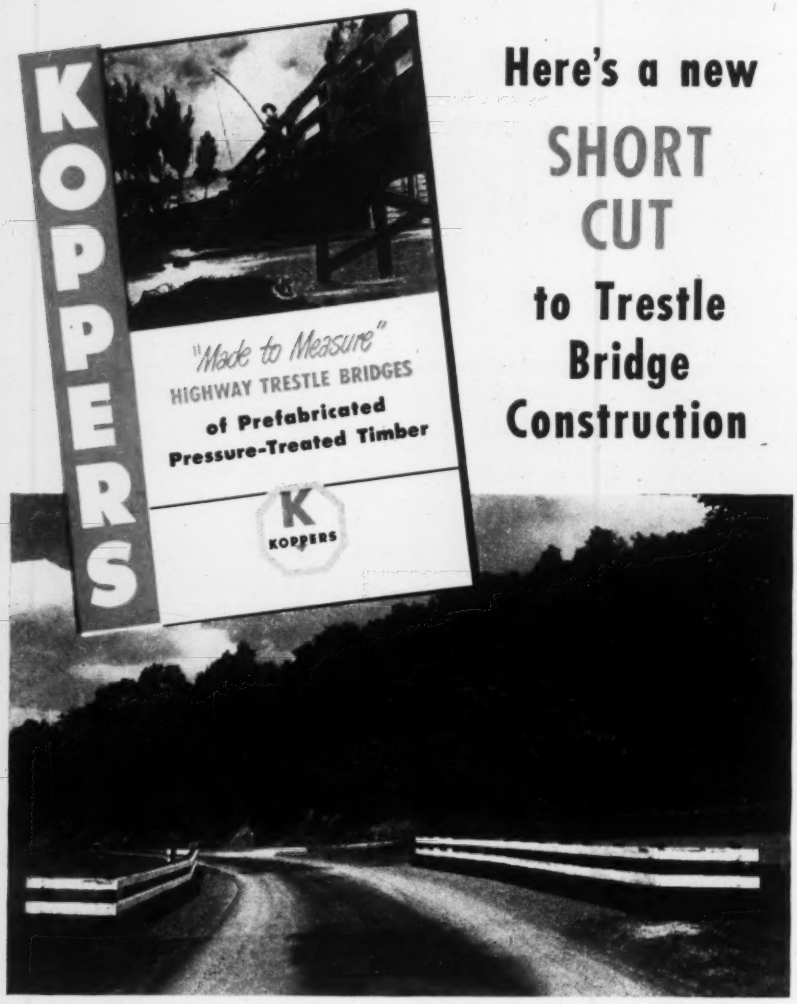

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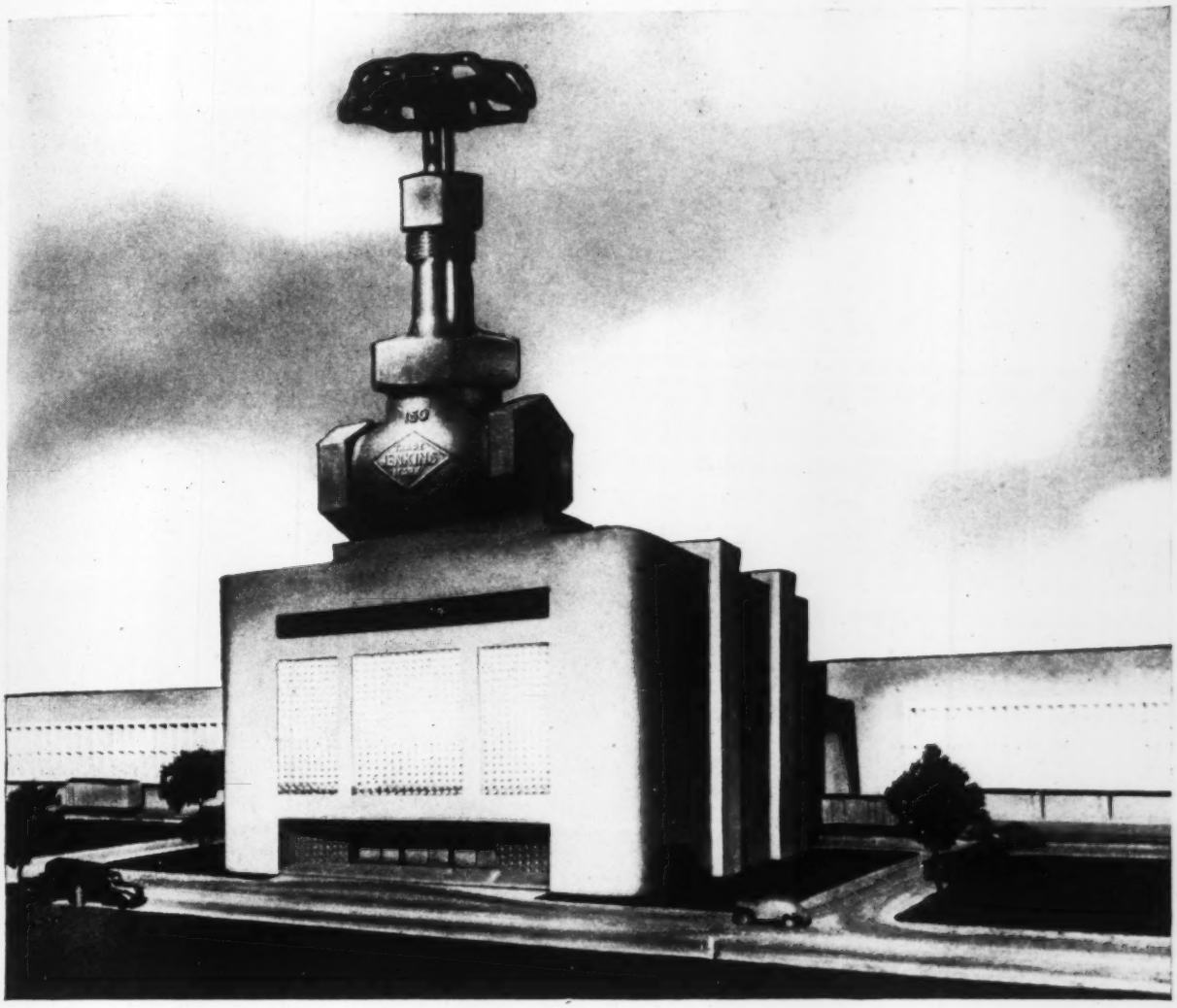
so operator can direct torch as fast or slowly as desired. Stainless steel wheel rolling along work keeps torch at uniform distance from it. Torch can be instantly released. It makes perfectly square cut-offs of plates, rods and bars. Cutter is 5 ft. long and weighs only 42 lb.—*J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Calif.*

93

A CONCRETE REINFORCEMENT BAR—This new deformed dumbbell-shaped bar is cold spiral bent and stretched to increase the yield point by 50 percent. On account of the method of manufacture it is really an individually tested bar. The great bond strenth of "Webrib" is derived from its shape and its transverse ribs. The manufacturer guarantees that the minimum yield point is not less than 60,000 lb. per sq. in., permitting engineers to design at a stress of 30,000 lb. per sq. in.—*Webrib Steel Corp., 120 Broadway, New York 5, N. Y.*

94

SINGLE-PHASE INDUCTION MOTOR—Capacitor-start, squirrel-cage motor has high-torque valves all the way up from standstill to full speeds. It is electrically reversible and characteristics are fixed, not subject to change by brush shift. Centrifugal switch is used on motors rated 1 to 3 hp. at 1750 rpm. and 1½ to 5 hp. at 3600 rpm. On larger ratings or special mountings, newly developed relay is used. Switch consists of rotating governor on shaft which actuates set of contacts in one of



There's Truth in this "Tall Story"

IF YOU THINK of *all valves* in this plant as *one valve*, you'll see the truth in this trick photo. Valves, collectively, represent one of the biggest investments in equipment in any plant.

That's why, with wages and material costs higher than ever before, it is just as important to keep a sharp eye on valve maintenance as it is on operating costs of larger plant units.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but, multiplied by thousands, it becomes a serious drain on operating budgets.

JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest-upkeep valves that money can buy. Second, with advice from Jenkins Engineers on any question of proper selection, installation, or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering service for lowest valve costs in the long run. *Sold through leading Industrial Distributors everywhere.*

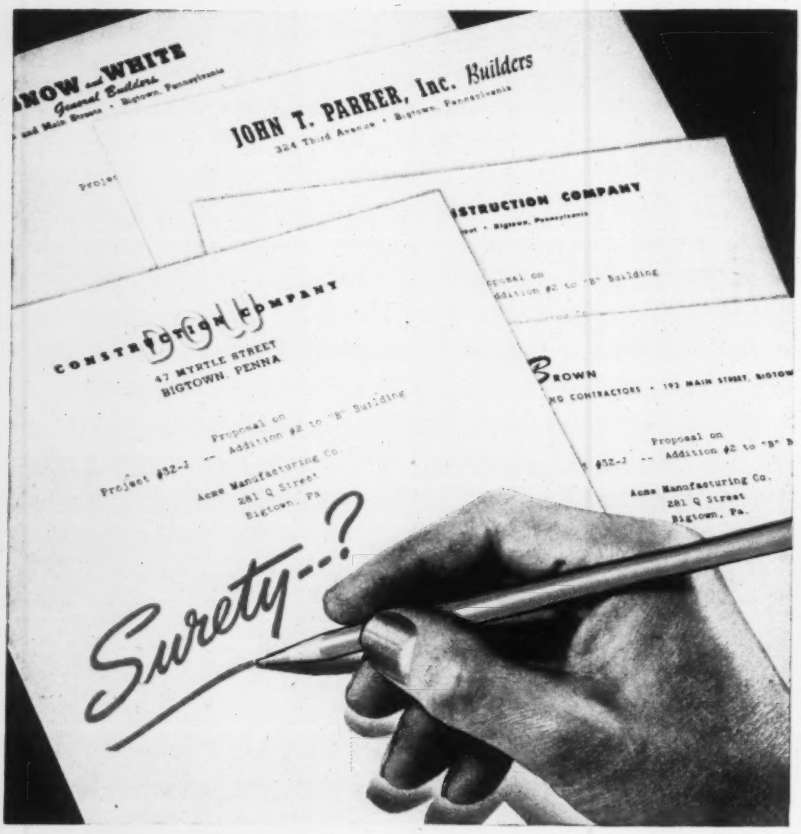
Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco.
Jenkins Bros., Ltd., Montreal.

"PREVENT VALVE FAILURE" is a 28-page guide to valve economy, fully illustrated, with case histories of valve damage, and recommendations for its prevention by proper selection, installation, inspection, and maintenance. FREE on request. Write JENKINS BROS., 80 White St., New York 13, N. Y.

LOOK FOR THIS DIAMOND MARK
SINCE 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



Who gets the Job?

As between several bidders, any one of whom might be awarded the contract on a basis of alternates, the awarding body may frequently be influenced in its decision by factors other than the actual bid.

Among these factors, your own reputation comes first, of course. But if you are bidding on a job where you are not well known, the good name of your *Surety* may very well swing the balance in your favor. Remember the old truth: "A man is known by the company he keeps."

The prestige of a financially sound, widely recognized Surety will help assure your bids of favorable consideration in any part of the country. Furthermore, if your Contract Bond is written by such a Surety, you need supply no further proof of responsibility. Establish your credit *now*—with a Surety whose integrity and financial strength is absolutely unquestioned.

Agents from Coast to Coast

ÆTNA CASUALTY AND SURETY COMPANY

Affiliated with Ætna Life Insurance Company

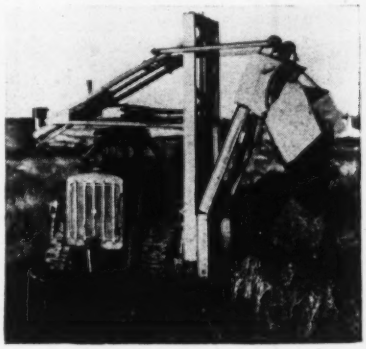
Automobile Insurance Company **Standard Fire Insurance Company**

HARTFORD 15, CONNECTICUT

end brackets. Relay is multiple unit, specially developed to provide protection against undesirable dynamic braking when motor is de-energized.—*Westinghouse Electric Corp., 306 Fourth Ave., Box 1017. Pittsburgh 30, Pa.*

95

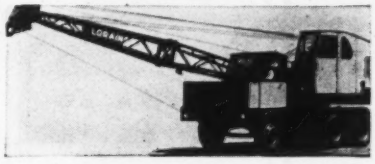
CRAWLER TRACTOR LOADER—By eliminating over half of the movement of crawler tractors, maintenance time and fuel costs are greatly reduced with the use of this new Decker "Swing-Around" loader. A short move of the tractor fills the bucket in lowered position. An hydraulic ram actuates ca-



bles to pull the bucket up the frame. While being raised, the bucket can be swung around to the discharge position. Three complete cycles a minute can be made with ½ cu. yd. and larger buckets. The loader will be made to fit several of the most popular models of crawler tractors.—*Decker Bros., Denver 2, Colo.*

96

DUAL CONTROL FOR CRANES—Dual control can be installed on any Lorain Model TL-20 mounted on stardard 4x4 or 6x6 rubber-tire Moto-Crane carrier which utilizes carrier engine and automotive propelling and steering mechanism for traveling to job at



speeds up to 33 mph. Once at scene, machine can be converted into self-propelled unit within 5 min., with on-the-job travel (1 to 7 mph.) powered by turntable engine only. All steering and brake controls are located conveniently at operator's position in turntable cab. Steering is controlled by air power.—*Thew Shovel Co., Lorain, Ohio.*

LOOK TO UNIVERSAL FOR

COST-CUTTING OUTPUT OF UNIFORM AGGREGATE

MORE TONS PER HOUR

ROCK PLANTS

546-P primary jaw crusher with 800 Series secondary roll crushing, screening, and loading unit.

LIME PLANTS

1800 Series secondary hammermill plant for producing aglime or road rock.

LESS COST PER TON

WASHING PLANTS

Crushing, screening, and washing plant with primary jaw crusher, secondary rolls, scrubber, classifier, conveyors and bins.

GRAVEL PLANTS

The TwinDual Master 24. Twice the capacity of conventional gravel plants of comparable weight. Three stages of reduction with primary jaw crusher and TwinDual* rolls.*

* PATENTED

FOR PRODUCTION AT A COST THAT LEAVES MORE PROFIT

BUY UNIVERSAL

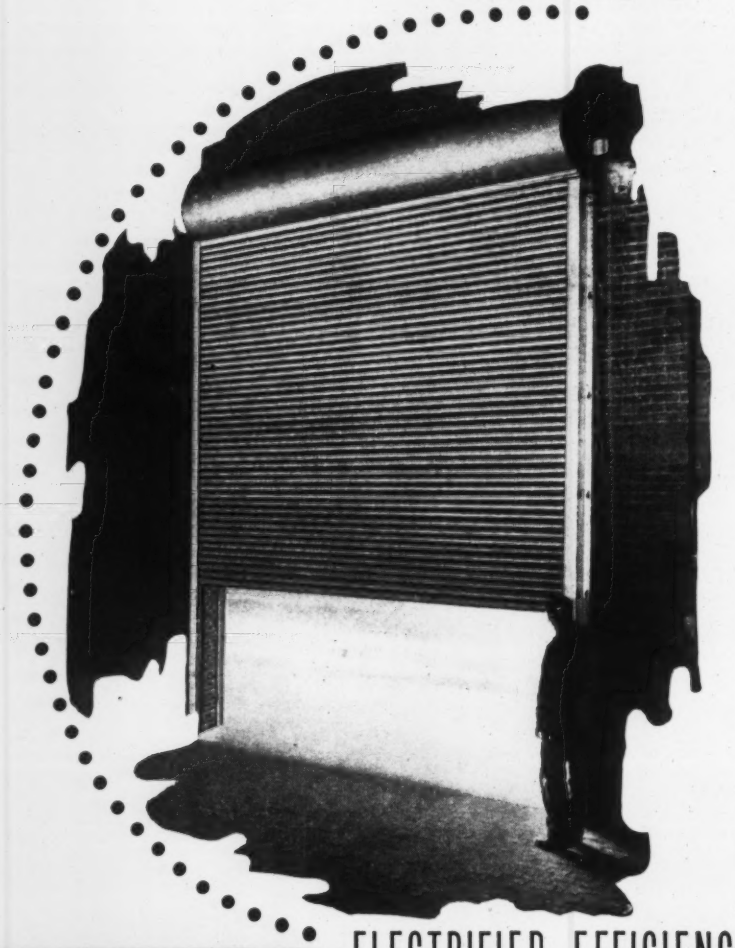
Universal "Stream-Flo" Engineering provides the perfect balance of high capacity units to assure steady flow of properly graded material. No starving, no glutting . . . results in more tons per hour at less cost per ton. Meet today's demands for more production at bid-winning costs with Universal crushing, screening, washing and loading plants. Investigate. Compare. Write for literature today.

UNIVERSAL ENGINEERING CORPORATION

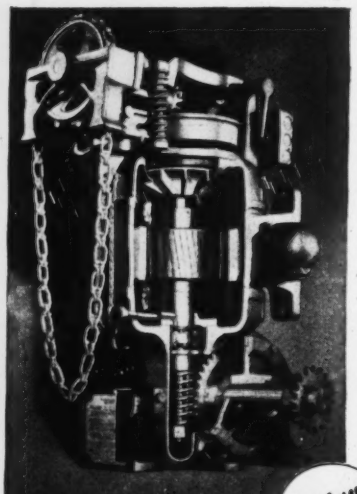
633 C AVE., N. W. • • CEDAR RAPIDS, IOWA

ENGINEERS AND BUILDERS OF "STREAM-FLO" ROCK, GRAVEL AND LIME PLANTS—SCREENING AND WASHING PLANTS—CONVEYORS—APRON FEEDERS

Do Your Doors Offer E.E.?



ELECTRIFIED EFFICIENCY



With the "electrified efficiency" of Motor Operated Kinnear Rolling Doors, you can speed up deliveries, keep door traffic moving faster, save time and labor, cut heating and air-conditioning costs by making it *easy* to close doors *promptly*. Push-button controls for each door can be placed at any point, with additional remote control switches if needed. And you get many other advantages from these rugged, all-steel, upward-acting doors. They save *usable* floor and wall space . . . coil out of the way overhead, safe from wind or vehicles . . . add to fire and theft protection . . . stand up longer, with less care, under hardest use. Built to fit any opening in old or new buildings. Write.

The KINNEAR MANUFACTURING CO.
FACTORIES
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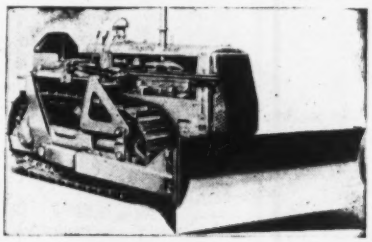
The rugged Kinnear Motor Operator brings maximum speed and convenience to door operation.

SAVING WAYS in DOORWAYS

KINNEAR ROLLING DOORS

97

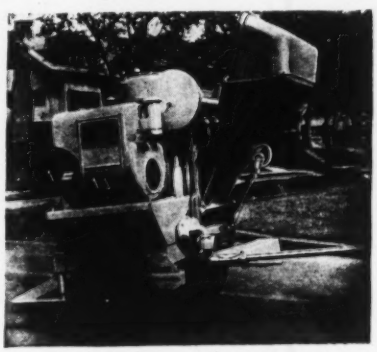
ANGLING-TYPE BULLDOZER—Placed on production for exclusive use with the Caterpillar diesel D4 track-type tractor is this hydraulically controlled bulldozer. This new tool gives increased earth-moving characteristics to that tractor by providing either straight or angling-type blades in the



range of operations to which a tractor of that size is applicable. The complete assembly consists of the blade, C-frame, trunnions, hydraulic mechanism and heavy-duty radiator guard which protects the front-mounted hydraulic pump. This bulldozer is suited to earth-moving tasks of the small contractor and to cleaning-up chores of the larger contractor.—*Caterpillar Tractor Co., Peoria 8, Ill.*

98

CONCRETE MIXER—New one-bag mixer, 6-S Trailsmith, features balanced, lightweight construction, with low center of gravity and auto-type leaf springs. It is claimed that every working part has been simplified and all surplus material eliminated. Other features include wear resistant alloy steels; automatic high frequency skip

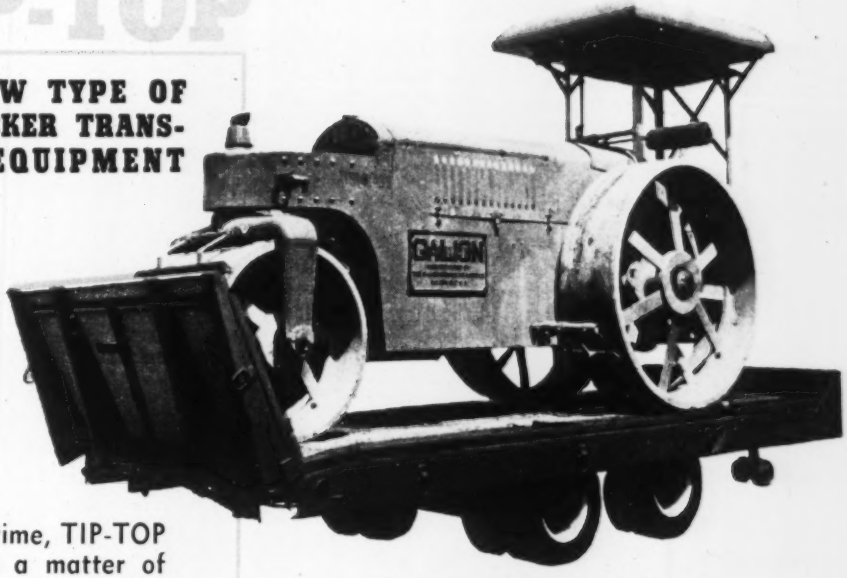


vibrator; multiple V-belt drive; inclosed gear reduction unit with machine cut gears running in oil; anti-friction bearings; shock-absorbing cantilever spring suspension; pneumatic tires; easy-to-reach water measuring tank; collapsible tow bar and pivoted support bracket; fast end loading and end discharge; and levers centralized for easy, convenient operation.—*T. L. Smith Co., Milwaukee, Wis.*

(*Continued on page* 182)

Introducing TIP-TOP

AN ENTIRELY NEW TYPE OF TRAILER FOR QUICKER TRANSPORTATION OF EQUIPMENT



Now, for the first time, TIP-TOP Trailers reduce to a matter of minutes the loading or unloading of all types of equipment such as Tractors, Bulldozers, Road Rollers, Trenching Machines, etc. Faster, safer, easier, this revolutionary new development in trailer design eliminates all need for blocking, skidding or winching.

Sturdily constructed with pressed steel frames, TIP-TOP Trailers are available in 7-ton capacity (single axle) or 12-ton capacity (tandem axle) and provide a liberal factor of safety for unavoidable overloads. Also, where desired, special capacity sizes can be made to specifications.

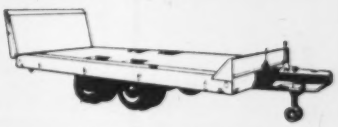
TIP-TOP Trailers are equipped with approved lights and reflectors, vacuum, air or electric brakes and comply with all state laws.

In addition to the transportation of mobile equipment, TIP-TOP Trailers have a wide variety of uses that greatly increase their general utility value. Practically any type of commodity, such as lumber, steel, pipe, etc., can be hauled. Stake pockets are furnished as standard equipment and stakes and racks can be supplied on request.

INQUIRIES AS TO OPEN TERRITORIES ARE INVITED FROM QUALIFIED DISTRIBUTORS.

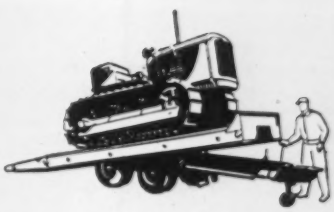
ARTHUR REHBERGER & SON, Inc.
320 Ferry Street **Newark 5, N. J.**

TIP-TOP TRAILERS MAKE LOADING and UNLOADING AS SIMPLE AS THIS!



1. Trailer before loading.

2. Tail skid is lowered and loading platform is raised by hydraulically controlled, hand operated pump.



3. Equipment is driven on under its own power with tail skid serving as ramp. Release valve is then opened so that loading platform will return to its original position and automatically lock. The tail skid is then hydraulically raised to shorten overall vehicle length and to serve as barrier for load.
In unloading, same procedure is followed and equipment is driven off under its own power.

TIP-TOP

TRAILERS

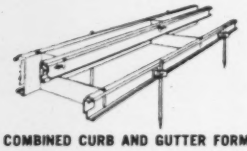
Patent Pending

For additional information on TIP-TOP Trailers, write for folder

"QUIT WORRYING ABOUT SPECIFICATIONS"

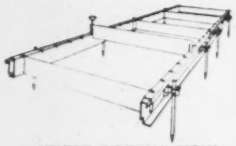
CURB FORMS

Sections 10' long—either straight or battered face construction. Steel forms for all special concrete curbs.



COMBINED CURB AND GUTTER FORMS

Each 10' section consists of 1 back curb form, 1 front gutter form and 1 face curb form, also 2 face curb form supports, 2 round stakes for back form and 2 round stakes for gutter form.



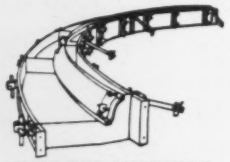
HELTZEL SIDEWALK FORMS

10' sections, slotted every 12" for division plates, which are removed without disturbing side forms after concrete takes its initial set.

HELTZEL

IS THE ANSWER

● Thirty-six years of concentrated engineering on concrete construction is at your disposal when you deal with Heltzel. As a result, the chances are, that what you may regard as a special problem is standard with Heltzel engineers. Illustrated here are a few of the basic Heltzel steel forms—many variations are at your disposal.



HELTZEL RIGID RADIUS FORMS

For building concrete curbs or curb and gutters when all intersections or corners must match. Heltzel forms made in sets to form a specified radius.

HELTZEL FLEXIBLE FORMS

Used when building radius curbs, curbs and gutters or sidewalks where the radius is subject to frequent change or for serpentine work in park areas.

CONCENTRATED Engineering IN CONCRETE CONSTRUCTION

Heltzel Steel Form & Iron Company, Warren, Ohio

Send me the following:

[ ] B-19 Steel Highway and Airport Forms

[ ] B-19A Steel Dual Duty Airport Forms

[ ] A-20 Steel Forms for Curbs or Curb and Gutters or Sidewalks.

Name_____

Address_____

City_____ State_____

(Type of construction usually engaged in)

Heltzel

BUILDS IT BETTER

BINS, Portable and Stationary
CEMENT BINS, Portable and Stationary
CENTRAL MIXING PLANTS
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
ROAD FORMS (with lip curb and integral curb attachments)
CURB FORMS
CURB AND GUTTER FORMS
SIDEWALK FORMS
CONCRETE BUCKETS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

99

VELOCITY POWER DRIVER—Utilizing discharge of blank cartridge as only source of power, new tool instantaneously drives steel studs into structural plate from ¼ to ¾ in. thick or through 3/8-in. maximum steel plate into concrete. Completely self-contained and weighing only 4½ lb., driver may be operated in any position or location. Its operation is comparatively silent, flashless and without recoil. Studs may be furnished with either ⅜-in. 16 thread or straight shank type with flared head. —*Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.*

100

MOTOR TRUCKS—New line of "job rated" trucks includes 248 basic chassis models ranging from 4,250 to 23,000 lb. gross vehicle weight and up to 40,000 lb. gross train weight. Front axles have been moved back and engines have been moved forward to place more of gross vehicle weight on front axle and provide better weight distribution. Seven improved engines handle power requirements of the new line of trucks. Braking systems are larger and improved. Front and rear axles have increased load-carrying capacity. Radiator cores have been redesigned to facilitate better cooling. Improvements have been made in frame construction.—*Dodge Division, Chrysler Corp., Detroit 31, Mich.*

101

NEW FUEL ADDITIVE—Induco Fluid, an additive for diesel fuel oils which produces greater power with more economical use of fuel, while reducing oil sludging, is now being marketed. The fluid takes quick chemical action against the sulphur, rosin, gum and tar content of the average fuel oil, turning them into readily igniting substances. Cleaner fuel and easier engine-starting result.—*Industrial Chemical Corp., 12-130 South Main St., Los Angeles 3, Calif.*

102

CHIPPING HAMMER — An improved chipping hammer is announced. The handle is machined to fit a drilled

BJ Pneumatic Sponge

'mops up' mixed solids and liquids

THIS AIR-MOTOR CENTRIFUGAL PUMP accomplishes rugged work without absorbing a lot of punishment. Designed for "mopping up" liquids containing a high percentage of abrasive solids, it passes sand, silt, and small gravel with minimum wear...Used in mine shafts, cofferdams, caissons, bilges, manholes, etc.

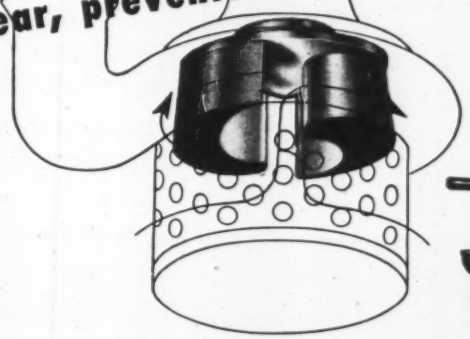
THIS COMPACT, PORTABLE Pneumatic Sponge operates in any position. A rotary air-motor, equipped with a governor and variable speed control, operates on compressed air at 70 to 100 psi. Write for bulletin and engineering information.

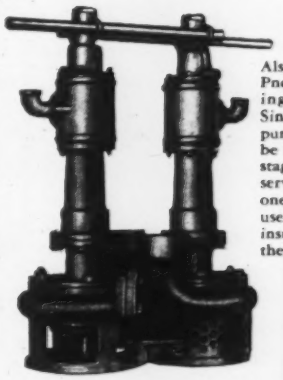
THREE TYPES AVAILABLE (Performance data for operation at 90 psi)

SIZE AND TYPE	CAPACITY	HEAD
2½" Single-Stage Sponge	25 to 125 gpm	50 to 160 ft.
2½" Double Stage Sponge	25 to 100 gpm	130 to 300 ft.
3" Single-Stage, Low-Head Sponge	120 to 300 gpm	25 to 57 ft.

circle S runner

reduces wear, prevents clogging





Also available as a two-stage Pneumatic Sponge for pumping heads up to 300 feet. Since each stage is a complete pumping unit, this pump can be separated into two single-stage pumps for lower head service . . . to do two jobs at one time. To double capacity, use the pumps in series. Or to insure constant operation, use the two pumps in parallel.

Byron Jackson Co.

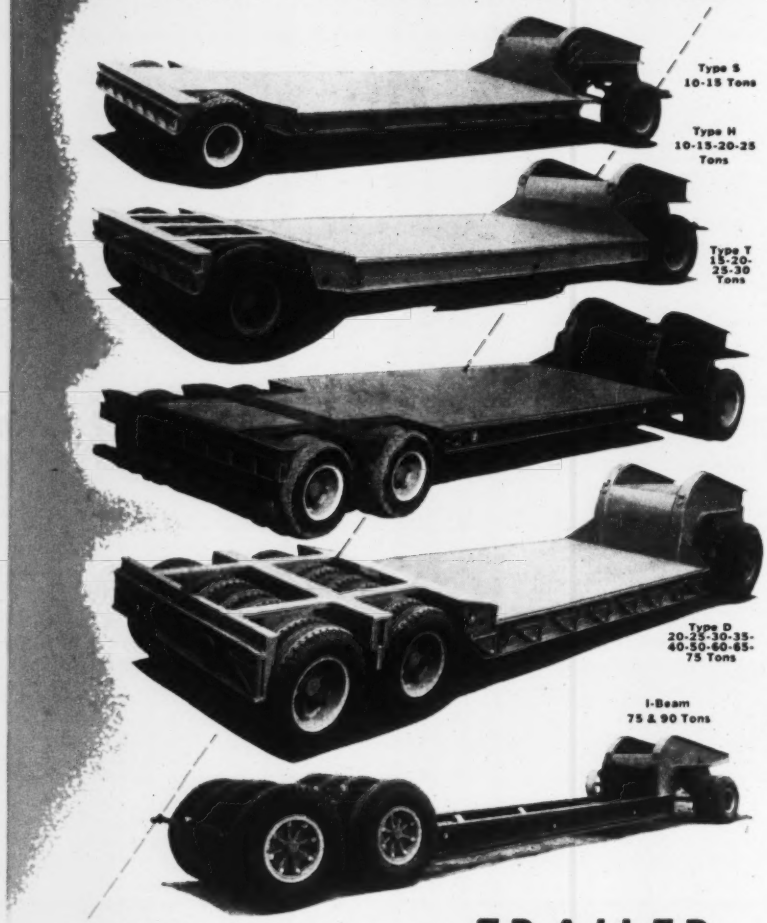
Established 1872

LOS ANGELES 54, CALIFORNIA

Offices in Principal Cities

5 BASIC TYPES...

Choose The One That Most Nearly Meets Your Needs... THEN WRITE TO US*

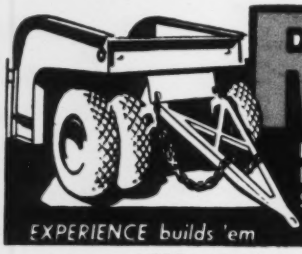


*WE'LL DEVELOP A *TRAILER* TAILORED TO CONFORM TO YOUR IDEAS

Rogers Trailers are "tailored to each specific need," utilizing basic types but built on a basis that utilizes economical, high production methods.

Versatility has always been an inherent feature of Rogers Trailers.

If you operate or contemplate the purchase of heavy duty trailers you'll benefit by writing for the Rogers Catalog.



ROGERS BROS. CORP.

DESIGNERS and BUILDERS OF HEAVY DUTY TRAILERS SINCE 1915

EXPERIENCE builds 'em — PERFORMANCE sells 'em

135 ORCHARD ST. ALBION, PENNA.

hole in the head and is silver-brazed into the hole so that the head can never "fly off the handle."—*Atlas Welding Accessories Co., 707 East Lewiston, Ferndale, Detroit, Mich.*

103

CARBON MONOXIDE TESTER—With indicator tubes developed by the National Bureau of Standards, this instrument determines the presence of carbon monoxide concentrations in the air, using a colorimetric method of detection. It is adapted to surveys of industrial atmospheres, garages, public utility mains and conduits, etc.—*Mine Safety Appliances, Pittsburgh 8, Pa.*

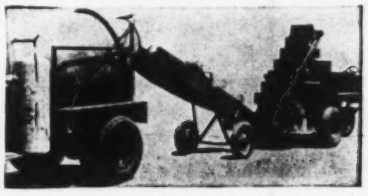
104

SEWER-CLEANING CARRYALL—A new type of carryall trailer for sewer cleaning work is built like a fire-fighting unit—ready to go on a moment's notice. It carries an entire "Flexible" rodding outfit; pipe guide, power drive, rod reel, hose, small tools and other

necessary incidentals. Trailer has pneumatic tires, large tool box with lock clasp, open box for bulky equipment, carrier underneath for 1½" pipe guide, and a removable caster wheel for pushing about the job.—*Flexible Sewer-Rod Equipment Co., 9056 Venice Blvd., Los Angeles, Calif.*

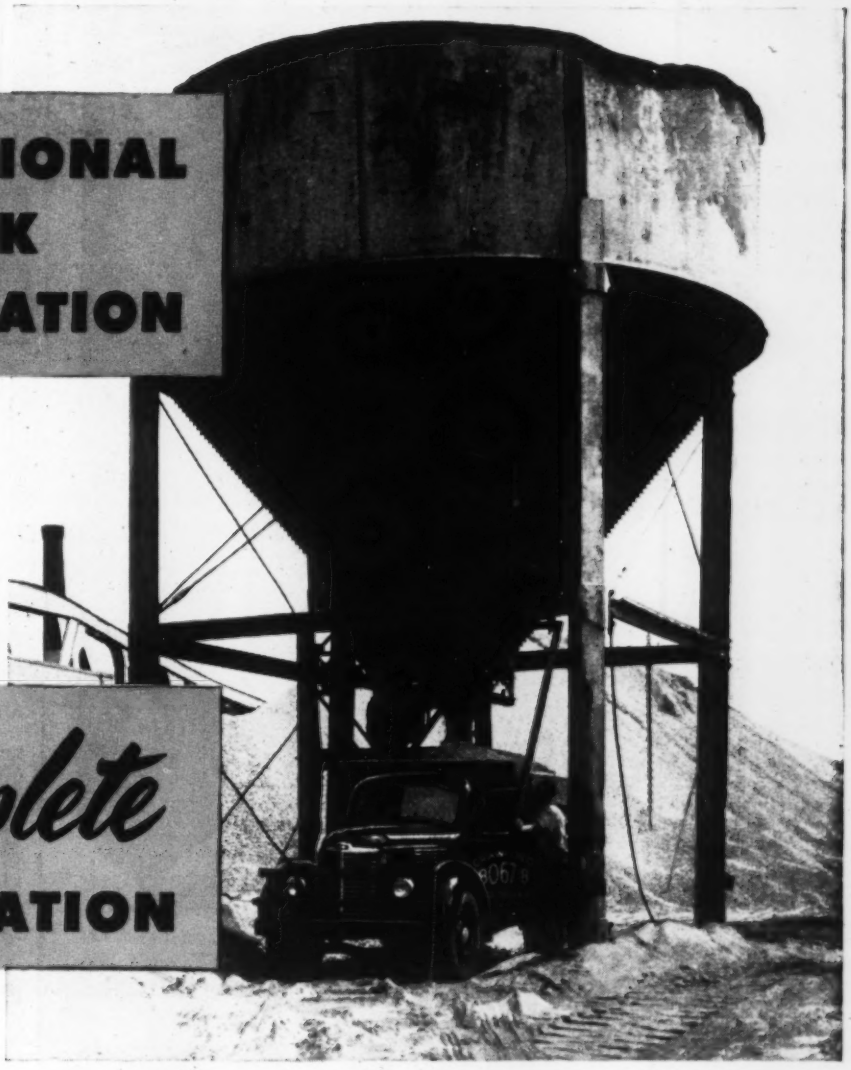
105

CONCRETE HANDLING EQUIPMENT—Three units for handling, mixing and pouring concrete are produced under name of Speed-King. Setup features mobile, self-loading weigh-batcher, which picks aggregate off ground with endless chain bucket elevator, weighing batch on three-beam boxed-in scale.



Weigh-batcher has 2½-yd. capacity, weighs 5,880 lb., is driven by 4-cylinder, 40-hp. Ford tractor motor, and is mounted on truck wheels. For loading mixer, wheel-mounted trailer slides un-

INTERNATIONAL TRUCK SPECIALIZATION



IS *Complete* SPECIALIZATION

International Trucks are completely *specialized.* Here's how:

They're *Performance-Co-Ordinated.* That means that engines, transmissions, axles and all other components are expertly fitted to the work each is to do.

They're *Load-Co-Ordinated,* by the exclusive International Truck Point Rating System. That means an accurate statement to each operator about the amount of payload that will be most profitable for *his* trucks on *his* particular operation.

Yes, International Trucks are sold *right,* specified *right* and serviced *right.*

Add the foregoing to the 41 years of demonstrated International Truck performance, economy and dependability, and you have the reason why:

International Trucks deliver outstanding service in the construction industry.

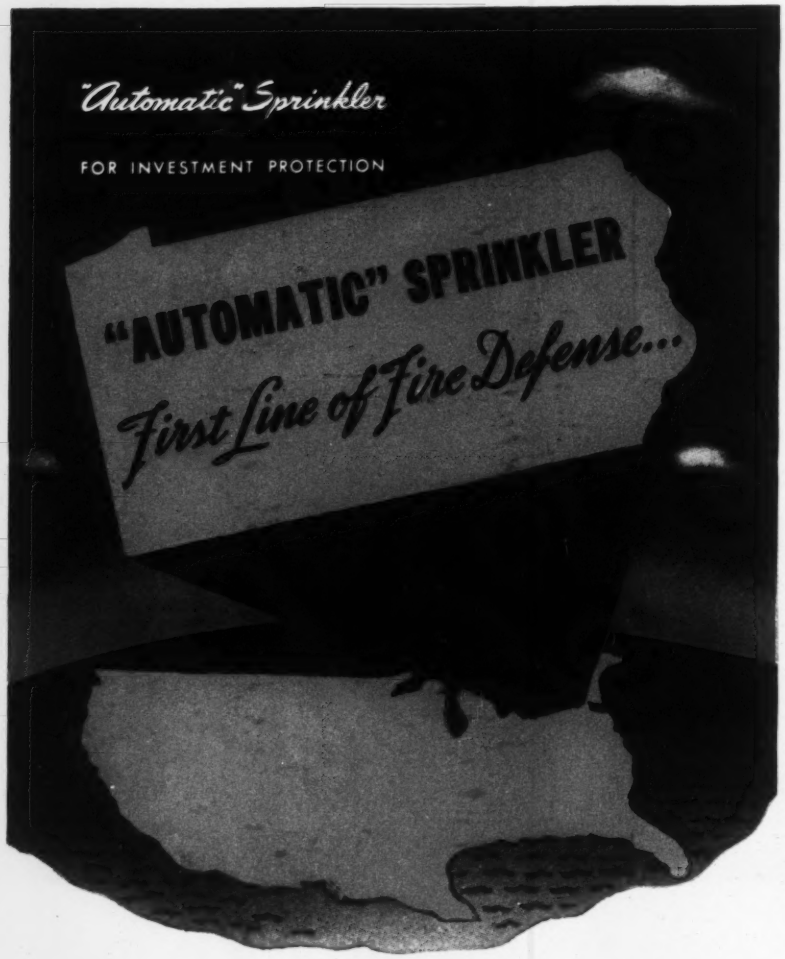
Motor Truck Division

INTERNATIONAL HARVESTER COMPANY • Chicago

Tune in James Melton on "Harvest of Stars." NBC Sundays.

THIS EMBLEM IDENTIFIES GREAT TRUCKS
INTERNATIONAL

INTERNATIONAL *Trucks*



In Pennsylvania . . . Elsewhere, too!

For thousands of years, the greatest amount of energy has been exerted to master fire, but fire is not a trivial matter and, although you may lessen its probability, you cannot remove its possibility. The lessons to be taught from fire are not to be found in the ashes of dissipated hopes. Tens of thousands of buildings, protected by means of "Automatic" Sprinklers, stand as "perpetual monuments" of foresight.

Claims may easily be made, but the accomplishments of "Automatic" Sprinkler during more than sixty years of fire protection development, must have ability behind them. Their position has been gained by fighting fire. They have won because they have outwitted fire.

Make "Automatic" Sprinklers your first line of fire defense, *they're an important investment today . . . perhaps welcome protection tomorrow.*

"Automatic" Sprinkler

FIRST IN FIRE PROTECTION

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"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
YOUNGSTOWN 1, OHIO
OFFICES IN PRINCIPAL CITIES OF NORTH and SOUTH AMERICA

der batcher at low end, receiving load on endless 20-in. rubber conveyor belt which unloads into mixer drum at high end. Operation is by 5-hp. aircooled gas engine or 2-hp. electric motor. Mixer, which fits on any 1½-ton short wheel base truck, operates of truck power takeoff, bia steel roller chain. It is regulated by rear outside throttle, as well as at driver's speed. Hatch or gate has been eliminated because of blade design, which is said not to slosh out mix. Mixer weighs only 2,000 lb. and has 2½-yd. maximum capacity and one-man discharge chute.—*Willard Concrete & Mfg. Co., Lynwood, Calif.*

106

TRUCKS—Complete line of 1948 trucks includes ¾ ton, ½ ton, 1 ton, and 1½ ton ratings. Also extra heavy duty 2½ ton and 3 ton lens chassis. Three new power plants are available for Ford 1948 trucks: 6-cylinder, 95 hp. truck engine; V-8 100 hp. engine; and heavy-duty V-8 engine developing 145 hp. for largest trucks ever built by Ford. All engines have heavy-duty oil bath air

cleaners, pressure-sealed cooling systems and a new weather-proofed ignition system with automatic spark control regulated by engine load and speed. Feature of new 6-cylinder engine is aluminum alloy pistons which are longer and plated to resist wear. The larger trucks have five-speed transmissions. The 2-ton and heavier models are equipped with vacuum power brakes.—*Ford Motor Co., Dearborn, Mich.*

107

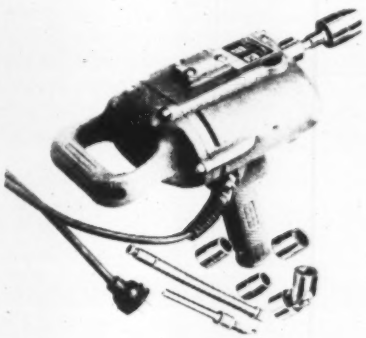
ELECTRODE—New copper-nickel allow electrode, Hobart Softcast A, is specially adapted to welding of cast iron where weld area must be machined, drilled or tapped anywhere in weld zone. It has miner flux coating for metallic arc welding. Weld deposits are non-ferrous. light gray in color, malleable, easily machinable and with tensile strength equal to good cast iron. Available in 3/32, 1/8, 5/32 and 3/16-in. dia. in 18-in. lengths, center brushed for a.c. or d.c.—*Hobart Bros. Co., Hobart Square, Troy, Ohio.*

108

MAGNETIC SWEEPER—New machine, with 36-in. sweep, removes loose nails from loading yards and roads. It requires no electricity and weighs 48 lb. Permanent Alnico magnets, guaranteed to last 5 yr., are used.—*Cesco, Inc., San Francisco, Calif.*

109

NUT SETTER—Lightweight, heavy duty Speed-o-matic electric torqueless impact nut setter. Will not twist in operator's hands. Operates at 1,750 rpm. at free speeds. At point of resistance delivers 3,000 impact blows per minute. Unit is reversible for running bolts or nuts. Operates on 110-v., 60-cycle a.c. or d.c. circuit. Weighs 13½ lb. Capacity up to ¾-in. bolts and nuts.—*Illinois Gage & Manufacturing Corp., 4639 W. Washington Blvd., Chicago 44, Ill.*



110

EQUALIZING SLINGS—A new design for level-load lifting slings, for introduction early in 1948, replaces all sizes of the former designs of the Caldwell Co. The sling automatically adjusts the length of the legs hooked to the load, according to weight distribution; the simple sturdy construction eliminates mechanical operating difficulties and the possibility of breakage, and the safety factor of five, and the load ratio of 2 to 1 is ample to give maximum safety in preventing tipping or slippage.

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111

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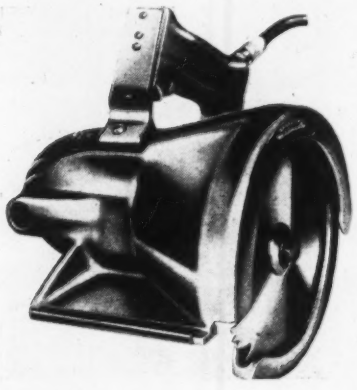
pencil or ink. Undercut prevents ink smears when guide is moved from one character to another. Guides come in sets of six.—*C-Thru Ruler Co., 827 Windsor St., Hartford, Conn.*

112

ELECTRIC HAND SAWS—Model 160 saw is equipped with 6-in. dia. blade, cuts to maximum depth of 2$\frac{1}{8}$ in., and weighs 10$\frac{1}{2}$ lb. No-load speed is 4,000 rpm. Model 180 saw has 8-in. dia. blade and is equipped with adjustable shoe for setting blade to any



angle from 0 to 45 deg. and adjusting depth of cut from 1 in. to 2 5/16 in. maximum straight cut. Maximum depth of cut at 45 deg. is 2$\frac{1}{4}$ in. No-load speed is 3800 rpm. Net weight is 15$\frac{3}{4}$ lb. Motor in both models is universal 110 v. ac-dc type.—*Bradford Machine Tool Co., Cincinnati, Ohio*

113

FUEL SYSTEM CLEANER—Penn Drake Gumout, new liquid carburetor and fuel system cleaner, is recommended by manufacturer for use in construction field because it absorbs water in fuel and dissolves and prevents gum formations. This eliminates necessity of draining fuel tanks when equipment is inactive. It is compounded of 100 percent active ingredients.—*Pennsylvania Refining Co., 2686 Lisbon Rd., Cleveland 4, Ohio.*

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● The day this picture was made the Austin Road Company of Dallas, Texas laid 8,220 ft. of 3 ft. shoulder to widen Route 66 east of Amarillo. In spite of the fact that traffic was maintained, high daily output placements ran up to 8,500 ft.

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FOR FAST AND LOW COST ACCURATE KNOWLEDGE OF BEDROCK CONDITIONS

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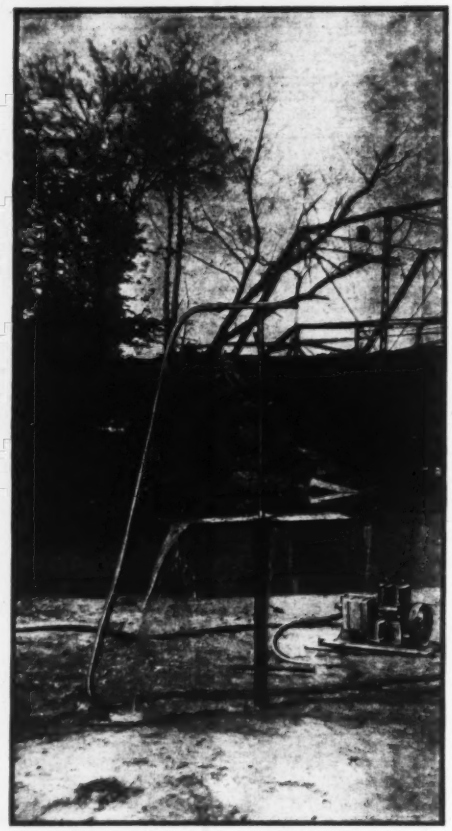

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Manufacturers' Publications

114

Squirrel-Cage Induction Motors—(16-p. bulletin) Describes line of type "CT" rolled shell, shaftless squirrel-cage induction motors for built-in drives with details of electrical and mechanical features, mounting, ventilation and applications.—*Louis Allis Co., Milwaukee 7, Wis.*

115

Steel Framing—(15-p. folder) Shows applications of V section for steel framing of buildings. Use of jig welded wall panels, load bearing partitions and lightweight roof trusses is described.—*Macomber, Inc., Canton, Ohio.*

116

Rotary Hole Saws—(Illustrated brochure) Describes uses of single- and multiple-cut rotary hole saws for cutting in sheet metals, wood, plastics, wall board, plywood, fiber and other materials.—*Misener Mfg. Co., Inc., 2022 Walton St., Syracuse, N. Y.*

117

Surface Hardener—(10-p. bulletin) Describes one-coat surface hardener for concrete and terrazzo surfaces. Testimonial letters set forth advantages of product.—*F. J. Morse & Co., Inc., 500 Minnesota St., St. Paul 2, Minn.*

118

Drill Pipe—(22-p. booklet) Tells story of development of plastic-coated drill pipe for drilling oil wells in highly corrosive fields. Results of field test and laboratory test program are featured.—*Spang-Chalfant Division, National Supply Co., Grant Bldg., Pittsburgh 30, Pa.*

119

Wood Preservatives—(16-p. booklet) Discusses chemical nature of penta chlorophenol, active ingredient in "Penta" preservative, and explains its wood preserving advantages.—*Chapman Chemical Co., Suite 544, 353 N. Michigan Ave., Chicago 1, Ill.*

120

Brass and Copper—(20-p. brochure) Deals with common uses of brass and copper in the home, including radiant

Chapman

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View Showing Internal Mechanism of Motor Unit.

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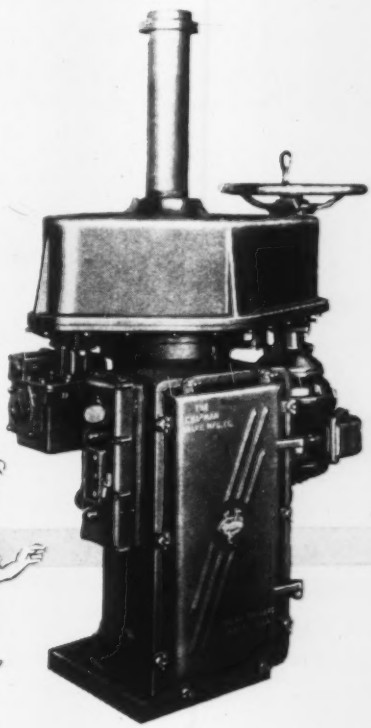

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heat, plumbing, roofing and screening. Many photos and drawings are included.—*Chase Brass & Copper Co., Waterbury 91, Conn.*

121

Vapor Saving System—(12-p. booklet) Describes method for determining which of flat-bottom tanks in vapor-saving system to equip with lifter-roof and method of computing correct sizes of vapor lines connecting tanks. Details of liquid-seal lifter-roof tank are shown in several elevation, plan and sectional drawings.—*Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago 4, Ill.*

122

Circular Saws—(4-p. bulletin) Provides convenient guide for determining which type and size of circular saw to use for particular job. Many types of saws and circular knives are illustrated. —*Chicago Saw Works, 5042 S. Wentworth Ave., Chicago 9, Ill.*

123

Vitrified Clay Pipe — (4-p. folder) Gives suggestions and recommendations on how to get best joints for vitrified clay pipe in sewers and drains.—*Clay Sewer Pipe Association, Inc., 1105 Huntington Bank Bldg., Columbus 15, Ohio.*

124

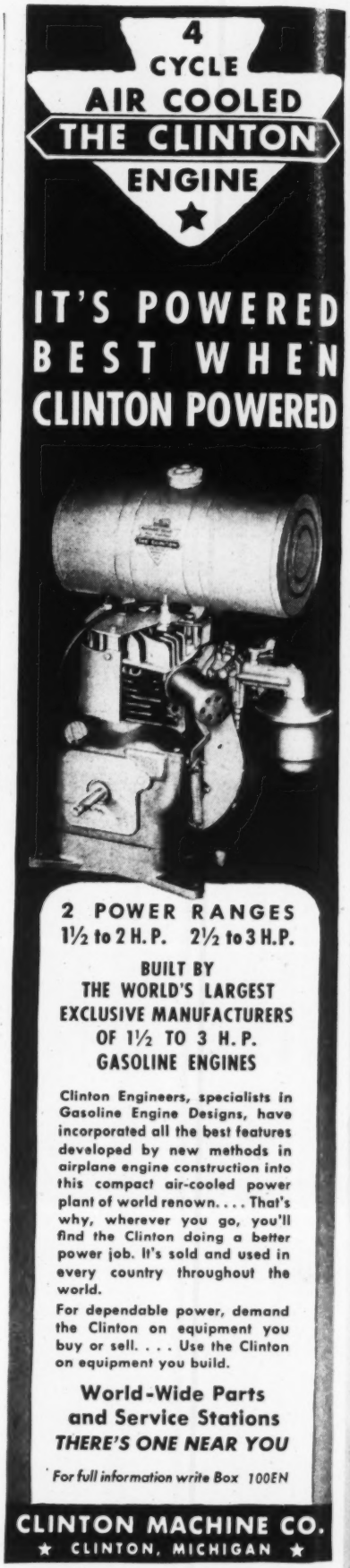
Frame Constants—(32-p. handbook) Contains 27,050 constants for 1,390 members, which will greatly facilitate analysis of almost any indeterminate structure. Also available is 24-p. booklet on sewage treatment works.—*Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill.*

125

Power Cranes and Shovels—(40-p. booklet) Presents functional design, job applications, and job analysis of power cranes and shovels. Text and pictures are taken from color strip slide film entitled "The Changing World", which is also available for loan without charge. —*Power Crane & Shovel Association, 74 Trinity Place, New York 6, N. Y.*

126

Air Diffusers — (32-p. handbook) Contains all information and engineering data necessary for proper selection of air diffusers, with full catalog data on various Kno-Draft adjustable ceiling diffuser types and accessories.—*W. B. Connor Engineering Corp., 114 E. 32nd St., New York 16, N. Y.*


4
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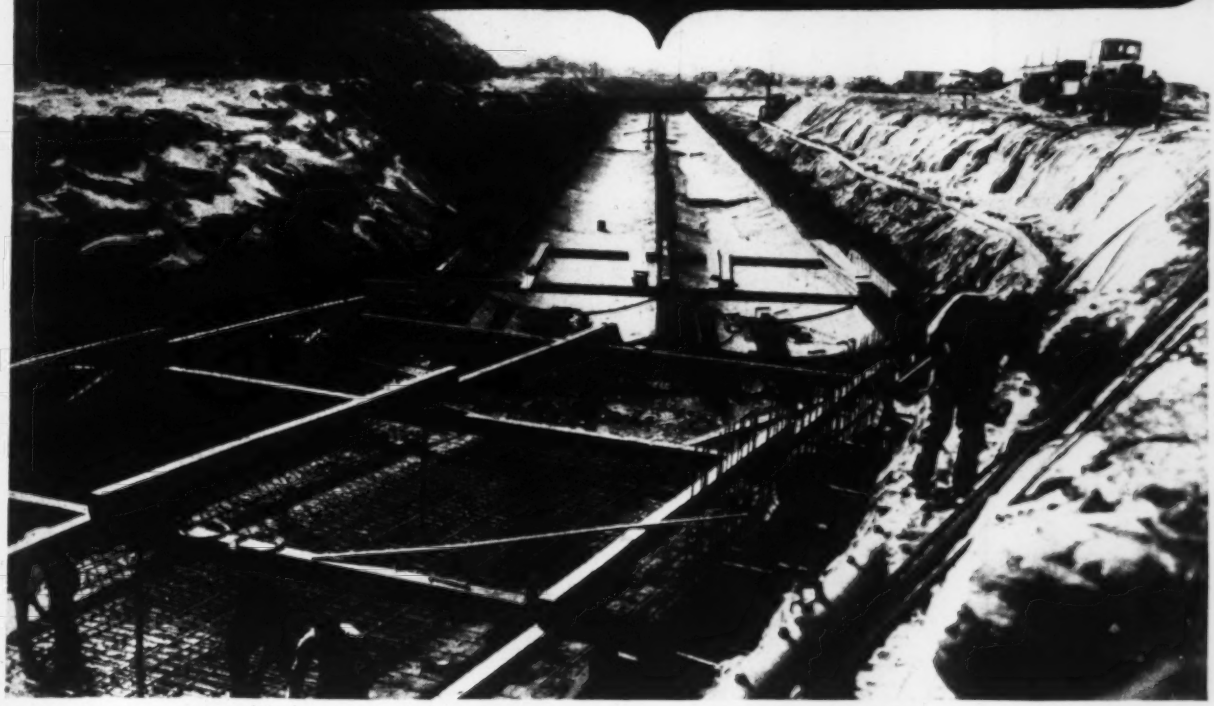

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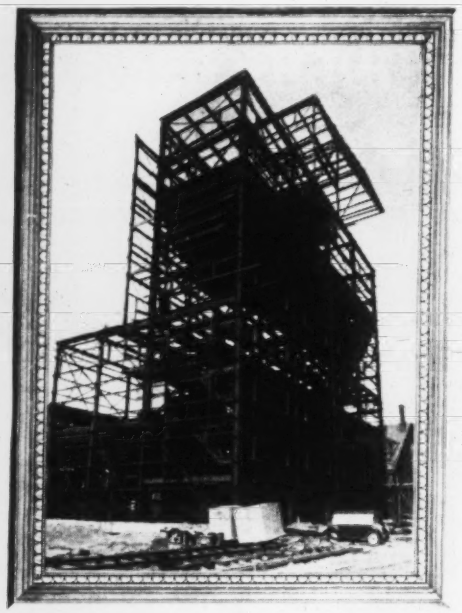

Rock wool plant for National Gypsum Co., Dover, N. J.

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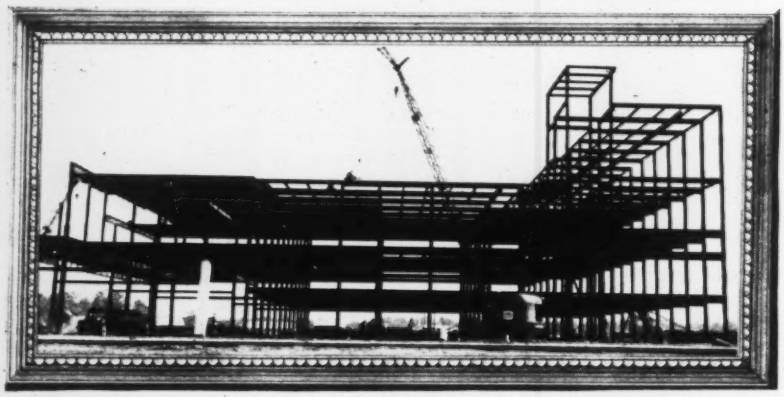
du Pont Nylon plant at Chattanooga, Tenn.



127

Diesel Engines—(20-p. magaz[ine]) Contains nearly 50 photos of typical [ap]plications of diesel engines, with sto[ries] about many large users of diesel po[wer]. Also available is 36-p. catalog on [the] line of 31 service-parts kits.—*Cumm[ins] Engine Co., Inc., Columbus, Ind.*

128

Water Tube Boilers—(16-p. booklet) Gives features of design and construction, as well as typical and special applications of water tube boilers.—*Dominion Bridge Co., Ltd., Box 230 Montreal, Que., Canada.*

129

Maintenance and Production Welding—(Two 8-p. bulletins) One covers welding cast-iron, low and high alloy steels, stainless steel and tool steels to high carbon steels; welding special manganese parts, elimination of undesirable characteristics, and other arc welding problems. The other describes use and applications of new developments in field of special flux-coated alloys known as EutecRods for steel, cast-iron, brass and aluminum, outlining correct gas welding procedures.—*Eutectic Welding Alloys Corp., 40 Worth St., New York, N. Y.*

130

Steel Shelving—(6-p. catalog) Lists various sizes of steel shelving for cabinets, files, trucks and other uses.—*Precision Equipment Co., 2658 N. Long Ave., Chicago 39, Ill.*

131

Pressure Grouting—(52-p. booklet) Describes methods, materials and equipment for pneumatic and hydraulic pressure grouting work. New Prehy grouter is described in detail, as well as auxiliary grouting equipment.—*Prehy Co., 243 Graybar Bldg., New York 17, N. Y.*

132

Brick and Tile in Housing—(Planbook) Shows six homes designed in accordance with cost-reducing principles of Industry Engineered Housing Program. Plans, developing adaptation of brick and tile construction, show two, three and four-bedroom houses, including elevations and floor plans.—*Structural Clay Products Institute, 1756 K St., N. W., Washington 6, D. C.*

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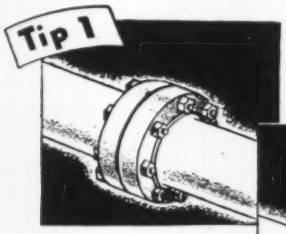

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On a 10" line at 150 lbs. steam pressure, you can save approximately ½ ton of coal per flange per year . . . simply by insulating all bare flanges with "Featherweight!"

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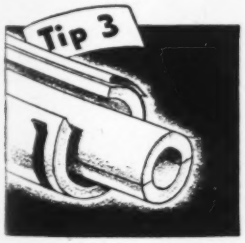
Similarly, gain further fuel savings by covering all valves, elbows and other fittings in the steam lines.



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1947

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MEN AND JOBS

Caleb Mills Saville, manager and chief engineer of the water bureau of the Hartford, Conn., Metropolitan District Commission, has resigned from that post, which he has held since 1912. In commenting on Mr. Saville's administration, *The Hartford Times* points out that "his accomplishments and the fine system which serves this area" is vindication of the decision long years ago to select a professional engineer to remove water supply matters from politics. Prior to going to Hartford, Mr. Saville was engaged on Panama Canal construction.

The appointment of **William I. English** as resident engineer of the new Veterans Hospital being constructed in Buffalo, N. Y., was announced by Col. Herbert D. Vogel, district U. S. Engineer. He succeeds Walter N. Renwick, resigned. Employed by the Georgia State Road Commission until 1911, Mr. English entered the Army and served overseas as a lieutenant colonel. He served as executive officer of the Buffalo engineer district for 15 months. Since his discharge from the Army early in 1947, he served as assistant chief of the construction division in the Buffalo district.

John J. White, Jr., former commander in the Civil Engineer Corps of the United States Navy, is in charge of the new Washington Office of the William L. Crow Construction Co. Joseph P. Comeau, engineer, with the company for 10 years, is in charge of the new Syracuse, N. Y., office, at 357 West Fayette Street.

E. C. Carson, Minister of Public Works, Province of British Columbia, Can., has resigned.

V. W. Johnston who has been city engineer for Joplin, Mo., recently was elected street commissioner to fill the vacancy caused by the death of John J. Saunders.

Lloyd Keefe, planning director of Rockford, Ill., and of Winnebago County, has been named chief planner of the Lucas County Planning Commission, Toledo, Ohio. He will be assisted by a staff of 15 men.

W. A. McArthur, town engineer and building supervisor of Weston, Ont., has resigned to go with a construction company.

John G. Jory, civil engineer employed in the Washington, D. C., area for a number of years, is now staff

14-Story Structure Erected Speedily, Quietly by Arc Welding

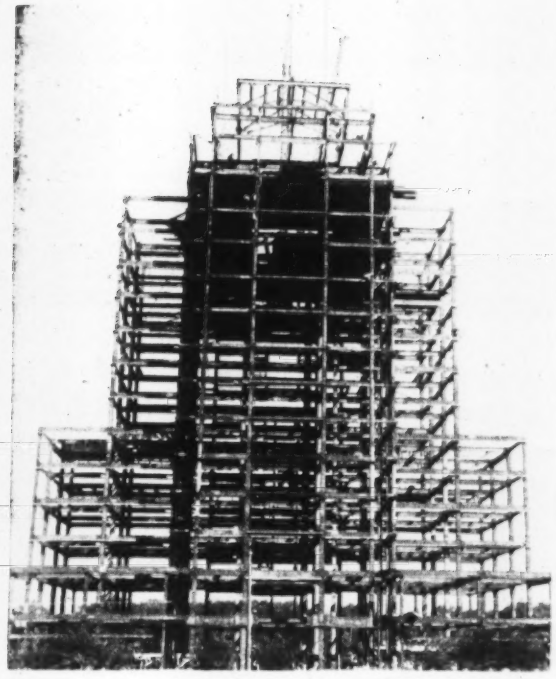

Fig. 1. All-welded structure of Hermann Professional Building.

By John R. Long, Mgr.
Houston Sales Office, Consolidated Steel Corp. of Texas
Orange, Texas

ONE of the tallest structures ever erected by arc welding is the Hermann Professional Building, a unit of the new Texas Medical Center under construction in Houston, Texas. The building is 14 stories with an additional first and second penthouse and hipped roof.

The 1400-ton structure (Fig. 1) was completely erected in 60 working days which is considered excellent speed for a building of this size and type. Considerable saving in steel tonnage was realized due to the structure's welded design. Eleven welders used approximately 40,000 pounds of Lincoln "Fleetweld 5" electrode for shop and field welding.

This is one of the first buildings of its type erected in the South, and exemplifies the rigidity and solidness of arc welded structures. There are 57 columns which, when set, were found to join perfectly.

Fig. 2 shows a connection from the spandrel beam to the corner column. Due to the flange connection, stiffener plates were required in the web and since the spandrel beam was centered on the flange of the column, the stiffener plate acts as a connection plate for the spandrel. Their entrant cut was necessary due to pipe chases in the floor.

As shown in Fig. 3, the column at the corner of the elevator opening is the only portion of the structure where cross-bracing was employed. It shows a typical connection of one of the many beams throughout the job that were offset from the center line of the columns. Due to the various types of conditions, a design was made of each connection and drawn in detail before any structural detailing was started. This enabled us to design nearly all connections for downhand welding. A welding sequence was employed throughout erection which proved economical in the fact that none of the structure had to be replumbed after welding had been completed. Engineers checked each column with a transit, and the column corners showed no more than a $\frac{1}{8}$" variance from top to bottom.

The architect firms which had joint responsibility for this job and the erection sequence are Hedrick & Lindsley and Kenneth Franzheim, both of Houston. The general contractor is Linbeck & Dederick Construction Co., Houston, and the Consolidated Steel Corporation of Texas is the fabricator and erector.

Conspicuous by its absence on this job was the noise usually associated with structural work. Silent erection, one of the advantages of arc welded structures, is particularly important in areas where quiet must be maintained.

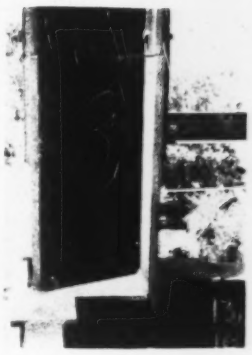

Fig. 2. Welded connections are simple in design. Bolts serve only to hold plates in position for welding.

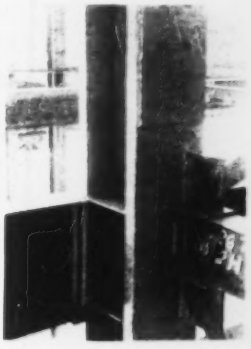

Fig. 3. Corner of elevator opening showing only place where cross-bracing is employed.

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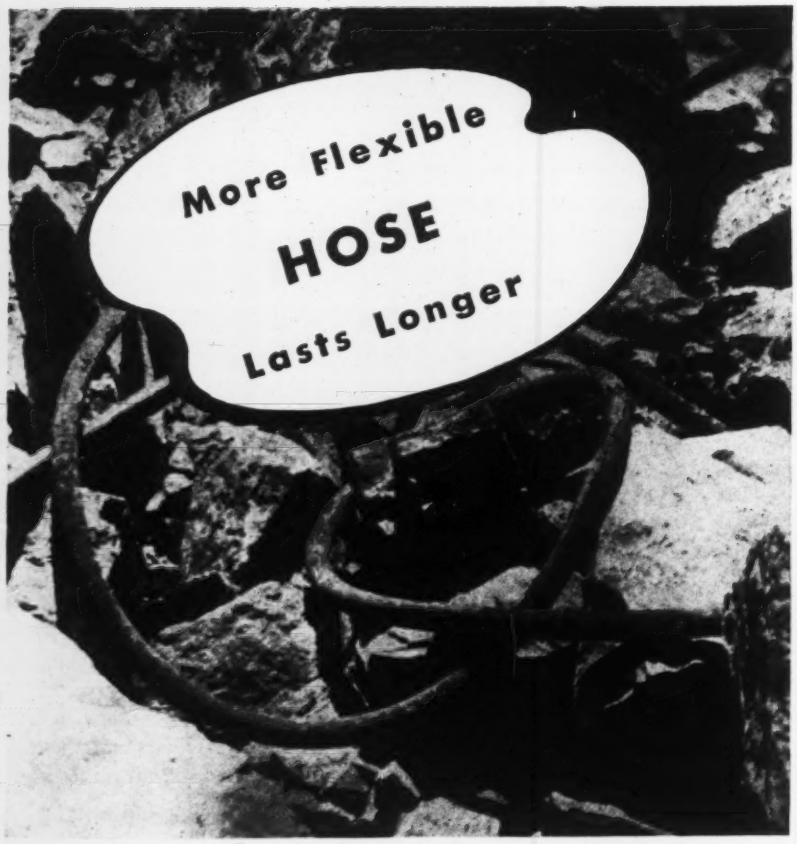

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engineer with the Chesapeak and Potomac Telephone Co. of W. Va. He is in charge of building construction. Mr. Jory who is a civil engineer graduate of Johns Hopkins University, was previously with the Chesapeake and Potomac Telephone Co. in Washington, D. C., supervising construction of a number of important projects.

The offices of public works director and city engineer for Great Falls, Mont., have been consolidated, with the duties of retiring City Engineer Ed J. Heaven taken over by **W. J. Wenzel**, director of public works since last August.

John Andrews, who has been with the U. S. Public Health Service in Washington, D. C., for the last seven years, has been appointed city chemist and superintendent of the municipal water works at Raleigh, N. C., succeeding Willis Holding, who has resigned to enter private business. A civil and a sanitary engineer, Mr. Andrews is a graduate of the University of North Carolina, he took graduate work at the University of Minnesota, and held an engineering position with North Carolina for eight years before going to Washington.

E. F. Koester, Wilmington, Del., traffic engineer, has been appointed Delaware state chairman of the American Public Works Association. He will coordinate the state activities of the association from Chicago.

E. C. Brandon, Jr., of Thomasville, N. C., a graduate of Virginia Polytechnic Institute, has been named city manager of Kings Mountain, N. C. He had been connected with the city government at Thomasville for a number of years.

Robert H. Fuller, who supervised construction of many of the larger air bases in Central and South America, has joined The H. K. Ferguson Co., industrial engineers and builders, at New York as a contract engineer in the eastern district. Mr. Fuller has been with Pan American Airways for the last seven years in a supervisory engineering capacity. He is a graduate engineer from Penn State.

Rudolph J. Walter, Jr., has been named construction engineer of the Bureau of Reclamation's Cedar Bluff Dam near Ellis, Neb. The dam is to be an earth fill structure 121 ft. high with crest length of 13,000 ft.

Henry G. Knox, a graduate of Annapolis who served 14 years in the Navy, with the rank of commander when he retired in 1920, has been appointed special technical advisor to the

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Pennsylvania State Sanitary Water Board.

O. R. Whipple, with the Bureau of Reclamation for 19 years, has been transferred from Missoula, Mont., to Dickinson to become resident engineer in charge of the dam and reservoir there.

Col. William E. Potter, Kansas City, Mo., district engineer for the Army Corps of Engineers since 1945, has been transferred to the post of Alaskan district engineer at Anchorage, effective March 15. His successor will be **Col. Paul D. Berrigan,** a classmate of Potter's at West Point, who now is assistant to the San Francisco district engineer.

Ole P. Erickson, until recently in charge of engineering and operations for Hendry Corporation, and before that connected with several large dredging companies, has formed the Erickson Engineering Co., Tampa, Fla. Under his supervision many improvements to hydraulic dredges and equipment, particularly rock dredging, have been developed.

J. Ellison Gray has been appointed sistant city engineer of Kitchener, Ont. He is a graduate of Queen's University, Belfast, Ireland.

Walter S. McDowell, associate civil engineer with New York State Department of Public Works, has retired after over 35 years. He was a 1903 graduate from Columbia University and first went to work for the American Bridge Co. Then for the Pennsylvania Railroad on the East River tube. He next went to Mexico for a year as a surveyor for the International Railroad. Returning to New York, he worked for Post & McCord and finally from 1909 to 1912 was with Hildreth Co. and also taught engineering at Manhattan College.

Carleton F. Sharpe has been elected the first city manager of Hartford, Conn. He formerly was city manager of St. Petersburg, Fla.

Frank R. Joslin has been appointed assistant construction manager of the New England Power Service Co., Boston, Mass. He joined the predecessor New England Power Construction Co. in 1928. In 1941 he became field assistant engineer on general construction, and in 1943 general foreman in the general construction department. After government service in 1944 and 1945 he returned to the service company as district resident engineer supervising field engineering groups on all construction jobs.

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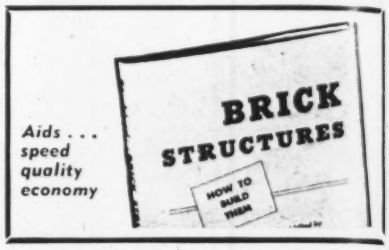

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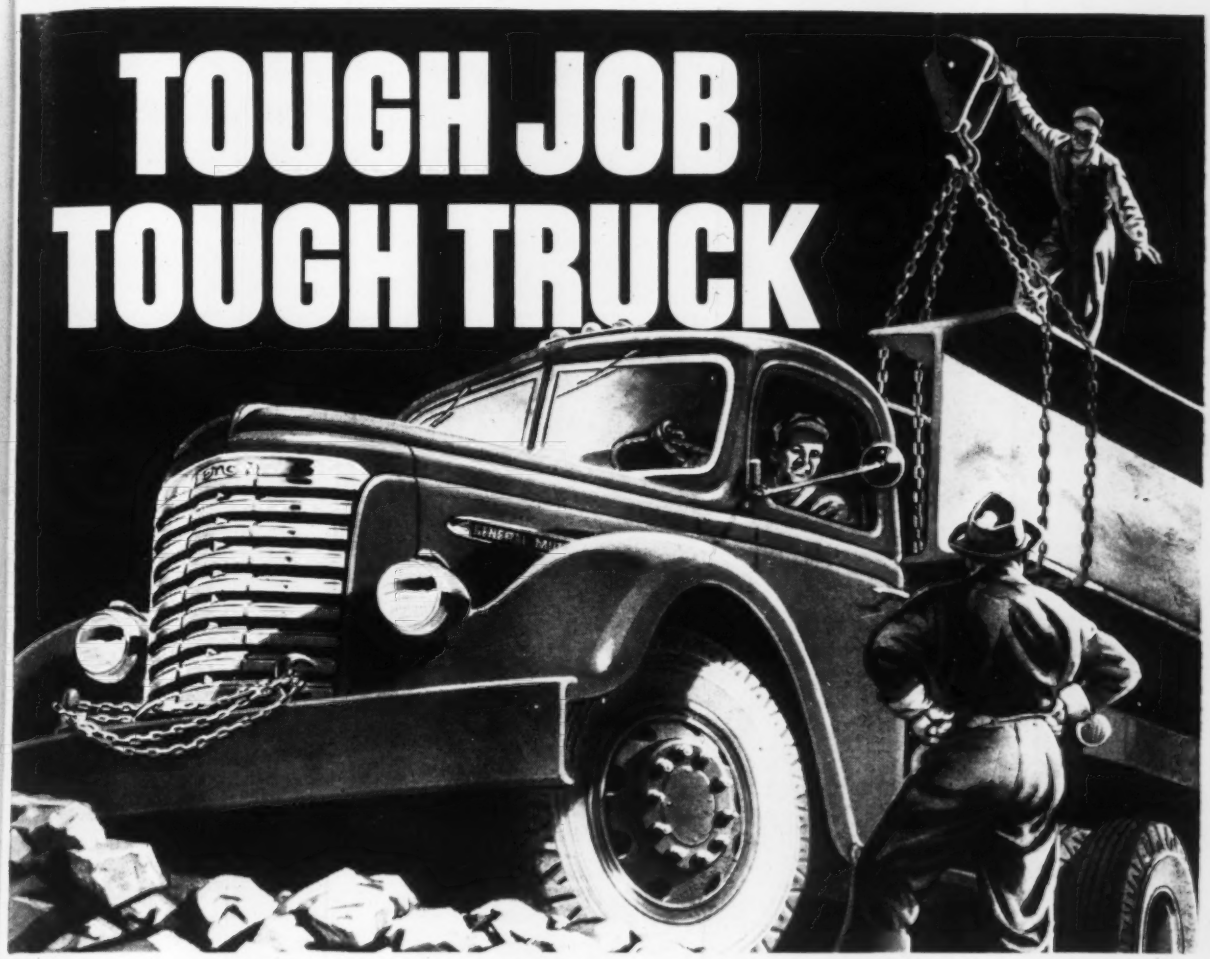

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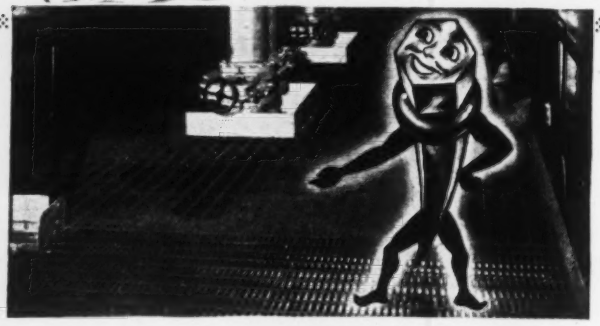

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Elections and Activities

W. R. Wise, engineer and assistant superintendent of the Newberry, S. C., waterworks, has been elected chairman of the Southeastern section of the American Waterworks Association. He succeeds W. H. Weaver, general manager of the DeKalb County Water System, Decatur, Ga. T. A. Jones, superintendent of water works at Fort Valley, Ga., was elected vice-chairman and W. T. Linton, of Columbia, S. C., continues as secretary.

John S. Whitney, Homestead, has been elected president by the Florida chapter of the American Society of Sanitary Engineers. The organization also elected: Glenn Presser, Miami, first vice-president; Martin O'Neil, Sarasota, second vice-president; Ray Dale, West Palm Beach, third vice-president; Nick Siegelman, Jacksonville, fourth vice-president; Frank McNellis, Coral Gables, treasurer, and John S. Mitchell, Miami, secretary.

R. J. Lockner has been elected president of the North Dakota Water and Sewage Works conference. Other officers elected are George Towman, Mandan, vice president; J. H. Svore, Bismarck, re-elected secretary-treasurer; W. J. Bell, Minneapolis, Minn., associate director; L. W. Veigel, Dickinson, and P. J. Hays, Williston, one-year directors; Selmer Endrud, Mayville, and H. H. Bellmer, Fargo, two-year directors.

Election of James D. Edmunds, Jr., of Baltimore, Md., as chairman of the Construction Industry Advisory Council has been announced by the Construction and Civic Development Department Committee of the Chamber of Commerce of the United States. The council is composed of more than 100 national trade and professional organizations with a substantial interest in construction.

C. M. Stanley of Muscatine and Joseph W. Howe of Iowa City have been nominated for 1948 president-elect of the Iowa Engineering society. The nominations were at a recent meeting of the board of representatives. The election will be at the society's annual meeting Feb. 17-18 in Des Moines. William P. Nemers, Des Moines, the 1947 president-elect will succeed to the presidency at the February meeting. Other engi-

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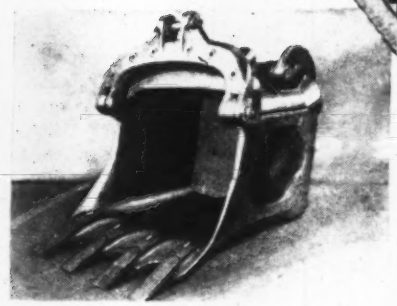
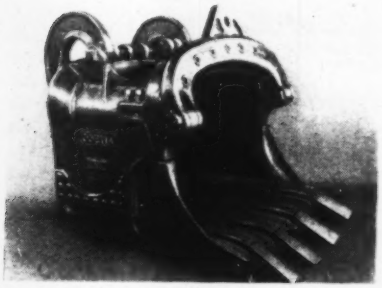
An Amsco 2-yard All-Manganese-Steel Welded Type Dipper gulps up a king-sized chunk of sandstone on a West Virginia airport job.



The Amsco All-Manganese-Steel Welded Type Dipper. Plug-welding of overlapping, rabbeted castings gives strength with minimum weight.



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Sharp, widely-spaced teeth are "fanned" slightly for scooplike, full bite of material. Lip is smoothly contoured with curved, easy-penetrating sides. Interiors are smooth to prevent clay building or arching of material . . . tight-fitting parts eliminate crevices and pockets where material can collect. The four-way taper out to door assures immediate discharge of entire load . . . latches hold securely; release instantly. The result: fast, full loading with minimum "crowd" and quick, complete dumping.

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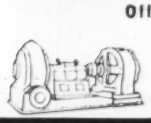

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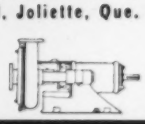

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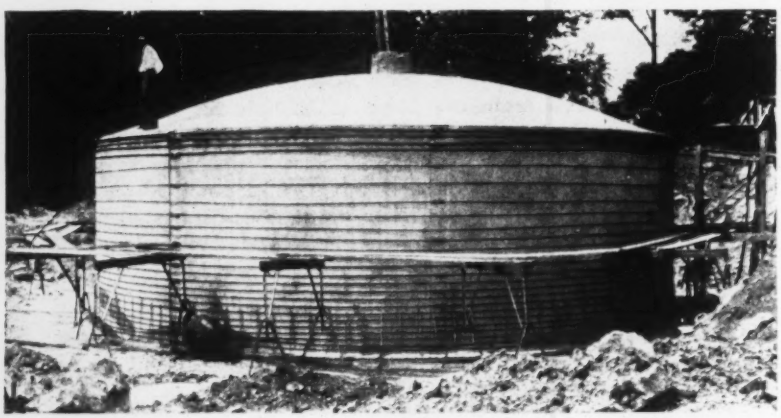

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neers nominated for 1948 officers ... Robert S. Casey, Fort Madison ... E. F. Behrens, Des Moines; for ... president: T. W. Thorpe and A. F. ... both of Des Moines for treasurer.

Russell DeGrove has been el... president of the Florida section o... American Society of Civil Engineers. Russell Redman was elected secretary-treasurer.

The new president of the A.G.C. of Iowa is H. L. Hook of Des Moines, vice-presidents are A. D. Ladehoff and Don Kaser; and treasurer A. F. Mathis.

The Nebraska State Irrigation Association has elected E. O. Daggett of Scottsbluff to succeed Lloyd C. Thomas of Kearney as president. Other officers named: Dr. G. E. Condra, dean of the conservation and survey division of the University of Nebraska, first vice-president; and C. Frank Butler of Cambridge, second vice-president. R. H. Willis of Bridgeport was re-elected for his 29th term as secretary-treasurer.

Carl Vogelgesang, chief engineer for the Indiana State Highway Commission, was elected president of the Indiana Section of the American Society of Civil Engineers at its recent annual meeting in Indianapolis. Other new officers are B. A. Poole, chief engineer of the Indiana State Board of Health, vice-president and Professor K. B. Woods, Purdue University, secretary-treasurer. The Indiana Section voted a life membership to Clarence L. Todd, consulting engineer of Richmond, Ind.

E. M. Shanley, San Francisco, has been elected chairman of the Civil Engineer Corps Reserve Officers Association of the Twelfth Naval District. He is a civil engineer with Fred J. Early Co., Inc. J. N. Spaulding, civil engineer with Pacific Gas & Electric Co., was chosen vice chairman and B. L. Nishkian, San Francisco consulting engineer, secretary.

The Spokane, Wash., section of the American Society of Civil Engineers has elected Harold J. McCoy as president, with Allen S. Janssen first vice-president, L. V. Douns second vice-president, William A. Hill secretary and R. E. Tobin and J. B. Barber associated engineer representatives. Charles Rea Moore of Washington Water Power Co., Howard Phelps of Washington State College and Verney Warren Russell of the Bureau of Reclamation were awarded life memberships.

Connecticut Rural Roads Improvement Association, Inc., has elected these officers: Eugene Latimer, Coventry, secretary to succeed William L. Higgins

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CONCRETE JOIST CONSTRUCTION

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In these days of high costs, economy in building is important, provided strength and durability are not sacrificed. Here is where concrete joist construction comes in—since it provides rigid, strong, sound-proof buildings which are fire resistive, yet construction cost is lower. That is because the amount of concrete and, consequently, the dead load, are kept to a minimum for any span or live load. The concrete joist and monolithic top slab are formed with cores of removable Meyer steelforms, supported on skeleton centering. Once the concrete has set, the forms are removed and re-used from floor to floor and from job to job. Therefore, a nominal rental charge can be made for each use. Construction is speeded up.

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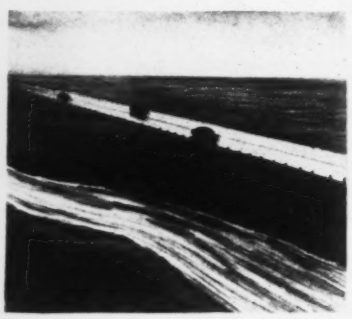
- *Pipe Joints — Water & Sewage Transmission Lines*



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of the same town. Dr. Higgins is retiring after 17 years in this post. Association members made Dr. Higgins a lifetime honorary secretary. Other officers were re-elected as follows: President, Louis G. Tolles, Southington; and treasurer, A. Ward Spaulding, Suffield.

J. T. Sturdivant of Miami, Fla., has been re-elected to serve his second term as president of the South Atlantic and Florida Ports Conference. Elected to serve with Sturdivant were Vice-president W. F. Clark, Georgia State Ports Authority, Atlanta, and secretary-treasurer I. Apolin, Greater Miami Traffic Association.

Alexander Brest of Jacksonville has been re-elected president of the Florida Road Builders Association. Other officers named are A. Deermont, Chipley, vice-president; J. H. Dowling, Tallahassee, treasurer, and John A. Long, Tallahassee, re-elected executive secretary.

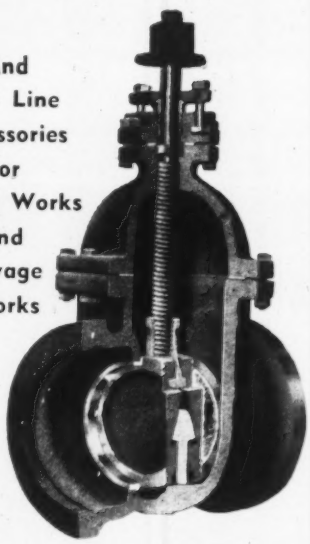
The Iowa section of the American Society of Civil Engineers has elected M. G. Spangler of Ames, president and Paul V. Roberts of Des Moines vice-president for 1947-48. L. O. Stewart of Ames has been re-elected to the office of secretary-treasurer and John M. Carpenter, Ames, was made a director.

L. A. Elsener, district manager of Chicago Bridge & Iron Co., has been elected president of the San Francisco, Calif., section of ASCE. A. W. Earl and G. B. Woodruff, both consulting engineers in San Francisco, were elected vice-presidents. New members of the advisory committee of the Junior Forum in the section are Arnold Olitt, assistant professor of civil engineering at the University of California, and R. R. Murdock, assistant engineer of the East Bay Municipal Utility District. B. W. Shackelford, assistant engineer for Pacific Gas & Electric Co., is secretary of the section.

J. M. Broughton of Raleigh has been re-elected president of the North Carolina Engineering Foundation, an organization which supports engineering research at N. C. State College. Other officers, also re-elected, are: Harry W. Straus of Brevard, vice president; R. D. Beam of Raleigh, secretary; and J. G. Vann of Raleigh, treasurer. Named to the executive committee are: William Muirhead of Durham, C. A. Dillon of Raleigh, F. D. Cline of Raleigh, E. A. Finley of Raleigh, James M. Pedan of Raleigh, K. Clyde Council of Wananish, John W. Clark of Franklinville, and David Clark of Charlotte.

HYDRANTS & VALVES

And Pipe Line Accessories for Water Works and Sewage Works



VALVES: A.W.W.A. type, iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

M & H PRODUCTS INCLUDE

FIRE HYDRANTS	SHEAR GATES
GATE VALVES	MUD VALVES
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WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
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EXTENSION STEMS	
CUTTING-IN TEES	

Write for Catalog No. 34

M & H VALVE AND FITTINGS COMPANY

ANNISTON, ALABAMA

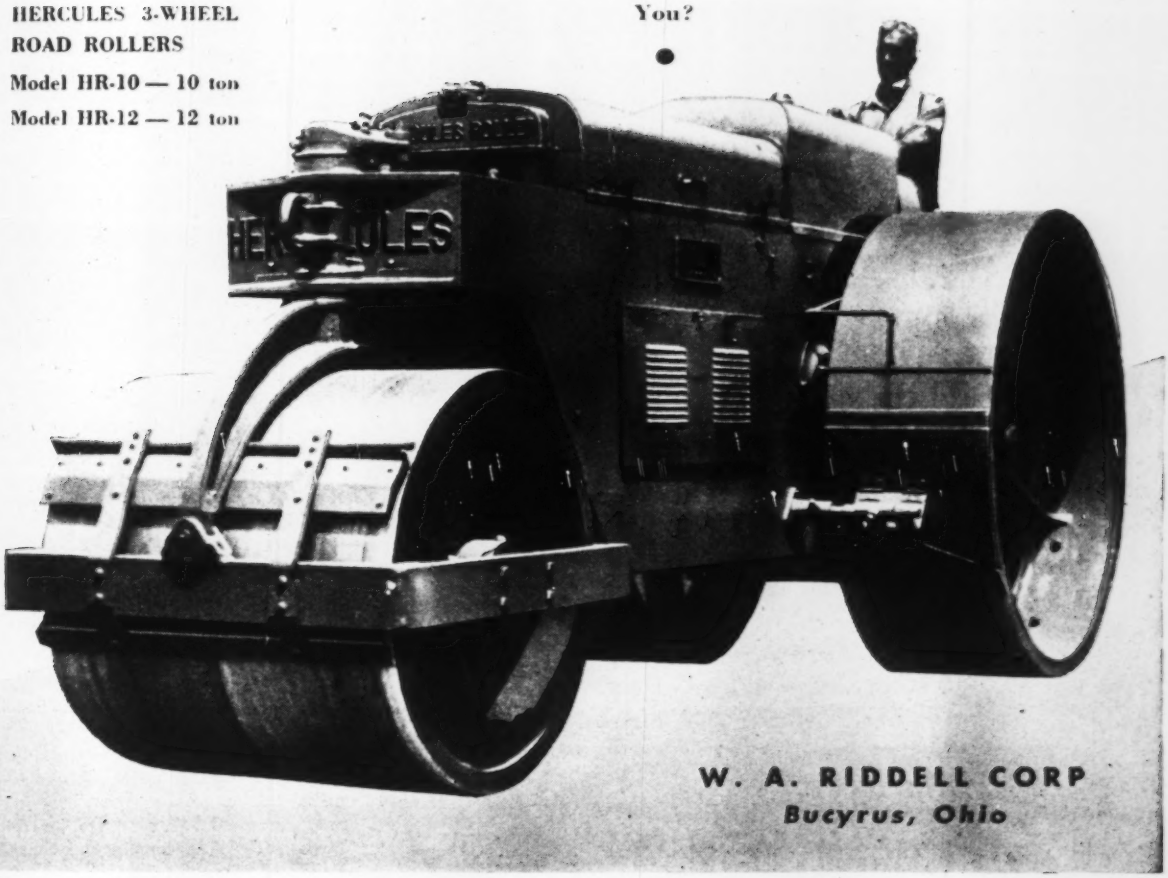
THIS MAN'S BOSS IS DOING OKAY!

Names are unimportant, so we'll just call him Jim Smith. Sure, you know him . . . he's the fellow who MAKES MONEY ON EVERY JOB! He's smart because he knows that good dependable equipment . . . equipment that won't let him down when the job is under-way . . . is just as important as knowing how to figure a profit on paper. Next time you get around Jim's equipment notice the name-plate on his three-wheel rollers . . . it's HERCULES! If Jim Smith makes money because he's got good dependable equipment . . . HERCULES ROAD ROLLERS included . . . it's a pretty healthy idea to take stock of your equipment. Is it giving you day-in-and-day-out dependable performance? Is it really turning your paper profits into "money in the bank"? Let us show you how HERCULES THREE-WHEEL ROLLERS perform for profit on every job. Yes sir . . . Jim is doing OK! Are You?

HERCULES 3-WHEEL ROAD ROLLERS

Model HR-10 — 10 ton

Model HR-12 — 12 ton



W. A. RIDDELL CORP
Bucyrus, Ohio

More Work... Better Work... Fewer Absentees !

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COOL, CLEAN WATER

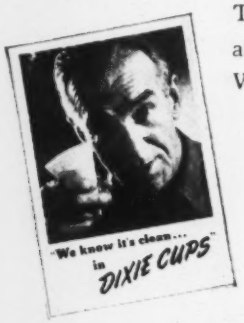
from the NEW

DIXIE WATER CARRIER

MORE WORK: Hundreds of man-hours are lost when men take time out to go for drinks of water. The new Dixie Portable Water Carrier takes plenty of good cool water right to the men . . . on the job.

BETTER WORK: Plenty of cool clean water keeps men stimulated and refreshed . . . they stay alert and "on the job". The Dixie Carrier holds four gallons in its well insulated tank . . . enough to keep a whole group going for hours.

FEWER ABSENTEES: The Dixie Portable Water Carrier is fitted with Dixie Cups (flat-bottom) or Vortex Cups (cone), the greatest little "cold-stoppers" in the world. Men need no longer be subjected to the germ laden dipper-and-bucket or water hose. Inexpensive, Dixie Cups or Vortex Cups provide individual service for each man. No longer need there be the danger of mouth-to-mouth contagion. There'll be fewer colds and other causes of absenteeism with efficient, economical Dixie Water Service.



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DIXIE CUP COMPANY
EASTON, PA.

DIXIE CUP

Manufacturers' Activities

Current developments among manufacturers relating to expansion of services, shifts in personnel, and other changes, include the following:

Home Office Changes—Walter S. Carpenter, Jr., who directed the affairs of E. I. DU PONT DE NEMOURS & Co. for eight years, has resigned as president to become chairman of the board . . . Charles S. Munson, formerly president of AIR REDUCTION CO., INC., has been elected chairman of the executive committee. He is succeeded by John A. Hill who becomes the fifth president of the company . . . William C. Kieley, formerly vice-president, was elected chairman of the finance committee. C. E. Adams remains chairman of the board of directors . . . Gilbert J. Haan has been named assistant vice-president of THE CELOTEX CORP., Chicago, Ill., to assist C. G. Muench, vice-president in charge of engineering. William M. McNeil has been appointed production manager of the gypsum and mineral wool division. M. C. Olson is now manager of the roofing allied products sales department . . . Mark A. Clement has been appointed general service manager of CATERPILLAR TRACTOR CO., Peoria, Ill. . . . Herbert L. Piasecki has been appointed assistant treasurer and A. B. Paape assistant secretary of the STEARNS MAGNETIC MFG. CO., Milwaukee, Wis.

Field Sales Changes—R. L. McCaffrey has been appointed assistant manager of the Lincoln, Neb., branch office of the motor truck division of the INTERNATIONAL HARVESTER CO. J. R. Scott formerly assistant manager at Lincoln has been transferred to Grand Island, Neb., in a similar capacity . . . Jason D. Rudding has become sales representative in Maryland, eastern New York and Pennsylvania, New Jersey and the New England states for RICHKRAFT CO., Chicago, Ill. . . . O. B. Roberts, manager of the industrial products sales division of THE B. F. GOODRICH CO. at Chicago has retired and is succeeded by John S. Gulledge, manager of the Cincinnati, Ohio, district. George W. Green is named manager of manufacturers' sales of industrial products in the Chicago district and E. E. Haupt succeeds Gulledge at Cincinnati. Robert T. Kain, manager of the industrial products district office in San Francisco has been transferred to Dallas, Tex., as manager, succeeding D. R. Anderson, assigned to special

Steer Without Stopping

with OSGOOD Air Control

Smooth, effortless steering—without stopping the forward motion of the machine—with the cab in any position—that's OSGOOD Air-Controlled Steering! Independent air cylinders, actuated by a small lever in the cab, disengage and set steering brakes on the driving sprockets instantly, eliminating the need to hunt for a point where a steering lock can be engaged.

OSGOOD Air Control means faster, safer operation . . . more work done in less time, with less effort. Plan now to choose an OSGOOD. A complete line of power shovels, draglines, cranes, clamshells, backhoes and pile drivers . . . a model for every type of work.

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G THE GENERAL CO.
EXCAVATOR

MARION OHIO

DIESEL, GASOLINE OR ELECTRIC POWERED • ⅜ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES

ARMORGRID FLOORING
withstands heaviest traffic

No matter how heavy the loads—nor how hard the traffic—Hendrick Mitco Armorgrids never require replacement. Completely fabricated units, Mitco Armorgrids require no bolts, rivets or assembly work. Neither do they depend upon fill for development of full strength in resistance to shock loads.

Unequaled for floors, platforms and ramps that have to withstand grinding loads, heavy shocks and continuous wear. Consult your architect or engineer.

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Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
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CLEAN
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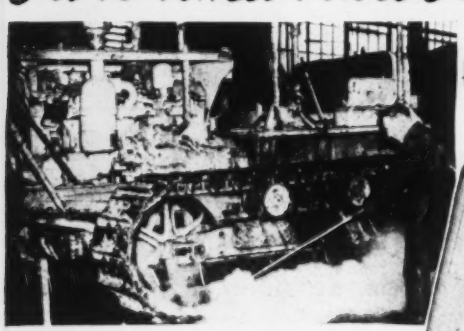

HYPRESSURE Jenny STEAM CLEANER

In less than a minute from a cold start, Hypressure Jenny's blast of steam, hot water and cleaning compound, loosens and flushes away almost instantly, mud, muck, dirt and grease from construction equipment.

When used to clean machinery before repairs, Hypressure Jenny saves as much as 40% of your mechanics' time which otherwise would be lost wiping oil and grease. Periodic Hypressure Jenny steam cleaning exposes lubrication fittings and grease cups and removes sand and grit which otherwise might enter bearings . . . reveals damaged or worn parts permitting repairs before service failures occur . . . eliminates fire hazards due to the handling of volatile cleaning fluids.

Hypressure Jenny is portable . . . fast . . . 8 to 10 times faster than hand cleaning . . . thorough . . . economical . . . safe and easy to use.

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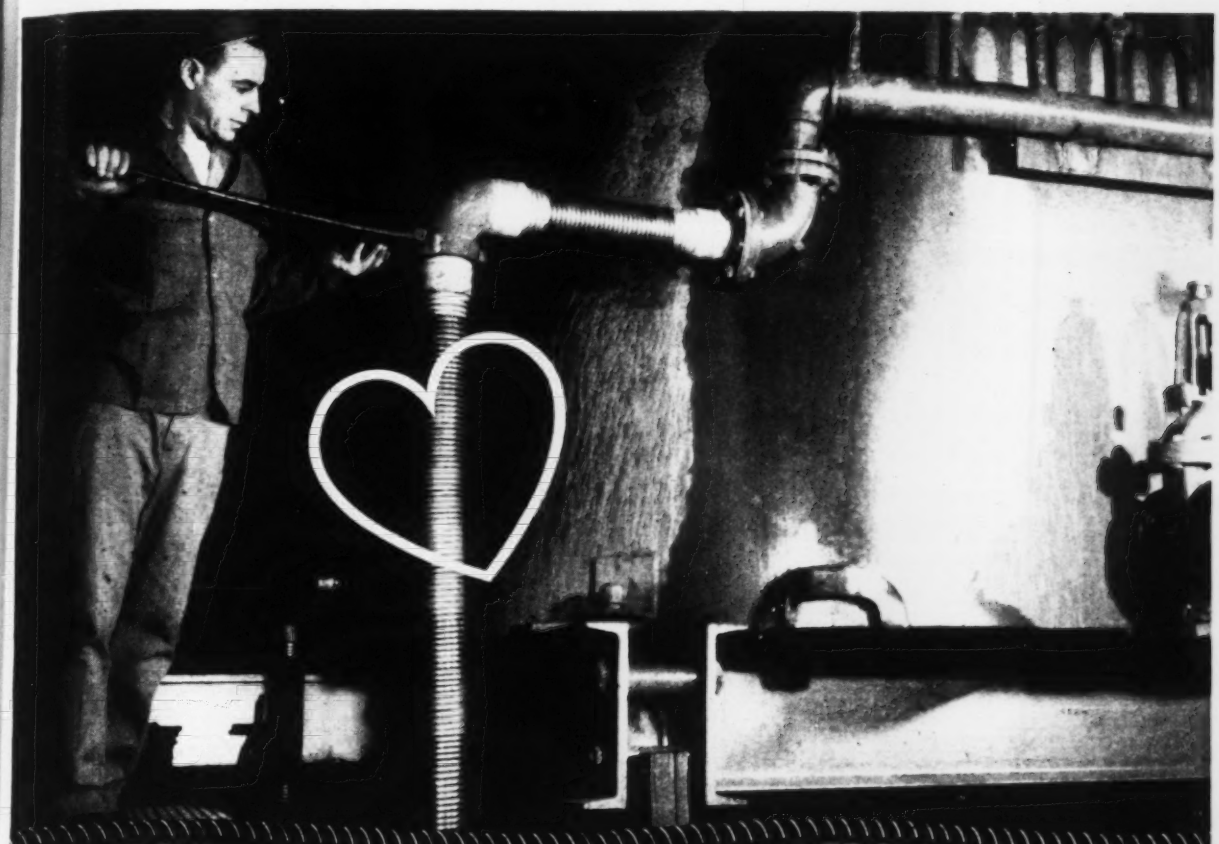
HOMESTEAD VALVE MANUFACTURING CO. P. O. BOX 31 CORAOPOLIS, PA.

sales duties . . . Link-Belt Co. has moved its Pittsburgh, Pa., district sales office to 5020 Centre Ave . . . Thomas E. Bertelsen has been appointed district sales manager of the Indiana-Michigan area of the Universal Atlas Cement Co. . . . Richard H. Diesel is now assistant general sales manager of the Stamford, Conn., division of The Yale & Towne Mfg. Co.

Dealer Appointments — The Gallagher Co., 545 W. 8th South St., Salt Lake City 4, Utah, is exclusive representative of Robins Conveyors division, Hewitt-Robins, Inc. for Utah, Idaho, Montana, Nevada and Wyoming . . . Davies Equipment Co., Trackville, Pa., is the Davey Compressor Co. dealer for the Pennsylvania counties of Lackawanna, Wayne, Pike, Luzerne, Wyoming, Monroe, Carbon, Schuylkill, Columbia and Montour . . . J. T. Conners, 851 Leader Building, Cleveland, Ohio, is northeastern Ohio agent for Lima Shovel and Crane division of the Lima-Hamilton Corp. . . . Cleveland Bros. Equipment Co., Inc., Harrisburg and Luzerne, Pa. will sell "Caterpillar" products in 32 counties of Central Pennsylvania . . . All Davey Compressor Co. products will be handled in 41 Texas counties by the Fry Equipment Co., 525 South 11th St., Abilene, Tex. . . . K. G. Holdom at 150 Broadway, New York City, has been appointed eastern representative for the gas processes division of The Girdler Corp., of Louisville, Ky. . . . J. C. Georg of Syracuse, N. Y. has been appointed distributor for eastern N. Y. state outside of metropolitan N. Y. City for the Goodall earth-mover made by The Warner & Swasey Co., Cleveland, Ohio . . . J-W Materials, Inc., Napoleon, Ohio, will be distributor for The Dewey and Almy Chemical Co.'s Darex AEA air entraining agent, manufactured at Cambridge, Mass., for the states of Ohio, Indiana, Kentucky, Tennessee, Alabama, Mississippi, Florida and the lower peninsula of Michigan.

Personalities — Thos. J. Bannan, president of Western Gear Works and Pacific Gear & Tool Works, with plants in Seattle, Wash., and San Francisco and Los Angeles, Calif., has been elected a national vice-president of the National Association of Manufacturers . . . A. R. McMannis, sales manager of the U. S. Quarry Tile Co., Canton, Ohio, has been elected 1948 chairman of the Tile Council of America, and R. E. Jordan, Jr., treasurer of the Mosaic Tile Co., Zanesville, Ohio, vice-chairman . . . Manfred Bowditch, formerly field director of the Saranac Laboratory and director of the division of Occupational Hygiene of the Depart-



QUICK "SWITCH" FOR TRANSFORMERS

Penflex metal hose cuts replacement time ⅓
... reduces costs ... speeds power resumption

Replacing faulty 220,000-volt transformers in a mammoth hydro-electric power station became a lengthy, troublesome task for one Eastern utilities company. When one of these 12 giants needs repairs, a spare has to be put in its place and quickly connected to cooling water pipes before resumption of service.

But since no two transformers are precisely alike, it was difficult to line up pipe flanges for bolting. Often special "wedges" had to be machined and inserted to obtain tight sealing . . . pipes had to be heated and bent . . . power output was delayed.

Troubles soon disappeared when Penflex engineers recommended 4" bronze interlocked flexible metal hose assemblies. Now, transformers are switched in almost ⅓ less time. Connections are quickly made because flexibility of hose allows for misalignment. Special machining and bending operations are eliminated . . . power is speedily resumed . . . man-hours reduced.

Penflex "Flexineering" (the science of engineering each type of flexible tubing to the problem) can help you iron out production wrinkles easily, economically. It will pay to know more about Penflex tubing layout service, streamlined for quick solution to your problems on flexible transmission of liquids, air, gases, or light solids. For complete service on flexible hose, tubing and couplings from ⅛" I. D. to 30" I. D., write today to . . .

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ment of Labor and Industries of Massachusetts, has been appointed director of health and safety of the LEAD INDUSTRIES ASSOCIATION . . . Harrison Rogers, vice-president and general manager of ROGERS BROS. CORP., Albion, Pa., has become president of the TRUCK-TRAILER MFGRS. ASSOCIATION . . . J. N. Lind has been promoted to assistant general traffic manager of the NATIONAL SUPPLY Co., with headquarters in the Grant Bldg., Pittsburgh, Pa. . . . W. K. Cox, assistant general sales manager of the CATERPILLAR TRACTOR CO., has become advertising manager to succeed Gerald M. Walker who has retired after 33 years with CATERPILLAR and the Holt MFG. CO., one of its predecessor companies . . . Walter F. Rockwell, president of THE TIMKEN-DETROIT AXLE CO., has been named secretary-treasurer of the AUTOMOTIVE AND AVIATION PARTS MANUFACTURERS ASSOCIATION, INC., for 1948, succeeding J. L. Myers of the CLEVELAND GRAPHITE BRONZE CO.

Miscellany — GOODMAN IRON & METAL CO., Zanesville, Ohio, has changed its name to THE GOODMAN STEEL & SUPPLY CO. . . . Long range management development programs which encourage supervisory personnel to broaden technical knowledge and accept greater responsibility are advocated by Harry F. Gracey, training director of SKF INDUSTRIES, INC. . . . Since December, 1939, a total of 3,771 men and women of THE B. F. GOODRICH CO., Akron, Ohio, have completed 20 years of continuous company service . . . THE JAEGER MACHINE CO., Columbus, Ohio, manufacturer of construction, paving and industrial machinery, has moved its eastern regional office from 8 E. 48th St., New York City to 1504 Widener Bldg., Philadelphia, Pa. . . . J. D. Ball, director of the truck and fleet sales department of the FORD MOTOR CO., says that a marked increase in the number of Ford dealers who are setting up separate truck sales and service establishments reflects a keener dealer interest in the truck business . . . Development of a hot material conveyor belt using glass instead of cotton fabric is announced by THE B. F. GOODRICH CO., Akron, Ohio . . . L. B. Smith, vice-president and director of the A. O. SMITH CORP., Milwaukee, Wis., has been appointed general manager of the Kankakee Works of that company . . . BUTLER MFG. CO., Kansas City, Mo., steel fabricator, has bought a building at Richmond, Calif., to serve Pacific Coast customers better . . . U. S. PLYWOOD CORP., New York, and THE MENGEL CO., Louisville, Ky., have jointly acquired a two-thirds stock interest and fifty per cent voting power in BLANCHARD DECO PLASTICS, INC. The name is to be changed to DECO PLASTICS, INC.

Engineering School News

A large network calculator installation, costing almost $300,000 has been put into operation on the campus of the Georgia School of Technology. It was obtained through a grant from the Georgia Tech Alumni Foundation; which, through two anonymous donors, has also equipped an hydraulic laboratory where will be studied such problems as the production of hydro-electric power, conservation and regulation of critically needed domestic and industrial water supplies, and control of floods.

B. E. Colley, instructor, civil engineering, former materials and testing engineer and assistant soils engineer for the Oklahoma Department of Highways, has been appointed to the faculty of the College of Engineering of the University of Florida.

The Alabama Polytechnic Institute Board of Trustees is studying the possibility of starting a building expansion program totaling approximately $2,000,000. Major building units in the proposed program include an engineering laboratory building, $986,500, and a classroom and laboratory building, $485,000.

Wesley L. Orr has been appointed assistant dean of the two-year-old college of engineering at University of California at Los Angeles. A graduate of the University of Colorado, he has been at UCLA since 1942. He previously did structural design work for the U. S. Engineers at Seattle, Wash. and was a Department of Agriculture engineer from 1934 to 1941.

Dean James Kip Finch of Columbia University's School of Engineering has been named an "Officer de l'Instruction Publique" and received the French "Ordre des Palmes Academiques". The award, the highest that can be bestowed by the Secretary of National Education in France, was given for an article written by Dean Finch over seventeen years ago. Entitled "French Pioneers in Engineering," it was a study of the contributions of eight French engineers of the 17th and 18th centuries. It was published in the *Engineering News-Record*, April 24, 1930.

Tau Beta Pi, national engineering honorary society, has established a chapter at the University of Rochester, N. Y. The new chapter is a successor of the Victorians.

CONSTRUCTION REPORTS

Proposed Work

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 18, N. Y.
ELSIE EAVES, Manager J. A. MAHONEY, Reports E. R. BIGGERSTAFF, M. R. ROESSLER, Statistics

WATER SUPPLY

PROPOSED WORK

Calif., Soledad—City, City Hall, voted **$100,000** bonds, water sys. imprvs. Clyde C. Kennedy, 604 Mission St., San Francisco, consult. engr. CD 1/9—ENR 1/22.

Idaho, Boise—Boise Water Corp., 623 Idaho St., 22,000 ft. 4-to-20-in. watermains, 1 each 2 m.g. and 1 m.g. reservoirs. **$273,000.** T. S. Flood, 1216 E. State St., consult. engr.

Ind., Connersville — Bd. P. Wks., Mayor G. R. Hendren, pres., City Hall, surveys, etc., imprv. WW., incl. rehabilitation, distr., water supply. **$200,000.** John W. Moore & Son, 830 Indiana Pythian Bldg., Indianapolis, consult. engrs.

●**Ind., Gary**—Northern Indiana P. Service Co., C. W. Goris, mgr., Gary, WW., filtration plant addn. **$1,000,000.**

Ind., Huntington—Bd. P. Wks., Mayor Roy Howell, chn., City Hall, imprv. WW, 500,000 gal. elevated steel tank, 14 in. main distr. line. **$150,000.** Jno. Wm. Moore & Son, 830 Ind. Pythian Bldg., Indianapolis, consult. engrs.

Kan., McPherson—City, imprv. WW., incl. water lines and water storage. **$350,000.** A. C. Kirkwood & Assoc., Wirthman Bldg., Kansas City, 1, Mo., consult. engrs.

N. Y., Carle Place—Carle Place Water Dist., Westbury Ave., water storage tank, wells and pumping units. **$300,000.** Sidney B. Bowne, 222 Front St., Mineola, consult. engr.

Okla., Ardmore — City, voted bonds, WW. extens. **$100,000.** W. R. Holway, 302 E. 18 St., Tulsa, consult. engr. CD 10/5/44—ENR 10/19/44.

Okla., Enid—City, voted bonds WW. extens. **$500,000.** C. C. Pate, Richards Bldg., Tulsa, consult. engr. CD 11/4 46—ENR 11/14 46.

●**Okla., Tulsa**—City, voted bonds, WW extens. **$15,750,000.** Dan W. Patton, city engr. CD 12/30.

●**Pa., Allentown**—City, dam and basin and incidental work for water supply. **$1,980,000.** Morris Knowles, Inc., Park Bldg., Pittsburgh, consult. engr. William R. Schnobel, supt. and engr. Bureau Water. CD 3/28—ENR 4/17.

Pa., Embreeville—Dpt. Property & Supplies, 18 and Herr Sts., Harrisburg, installing water distr. sys. and constructing 1 m.g. storage reservoir at Embreeville State Hospital. John H. Wickersham, 14 S. Duke St., Lancaster, consult. engr. A. F. Jones, c/o owner, ch. engr.

Tex., Spur—City, WW sys. enlargements, extens. **$140,000.**

Wash., Darrington—City, City Hall, water sys. **$103,000.** Parker & Hill, Smith Tower, Seattle, Zone 4, consult. engrs.

Wash., North Bend—Town, Town Hall, water sys. **$125,000.** Parker & Hill, Smith Tower, Seattle, Zone 4, consult. engrs.

Alta., Cardston — Municipality, water sys., incl. 3½ mi. 14 in. watermain line Lee Creek to supply the reservoir. **$100,000.** Aldridge, Cardston. CD 5/10/44—ENR 5/18/44.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Calif., Marysville — City, City Hall, voted $260,000 bonds, disposal plant. **$320,000.** C. C. Kennedy, 604 Mission St., San Francisco, consult. engr. CD 1/7—ENR 1/22.

Calif., Pleasanton—City, City Hall, $125,000 bond election Mar. 2, modernization, expansion sewage disposal plant. **$120,000.** Roy E. Ramseier, 3813 Parker St., Berkeley, consult. engr. CD 3/13—ENR 4/3.

Del., Wilmington—E. I. du Pont de Nemours & Co., Nemours Bldg., plans completed. Du Pont Country Club sanitary sewers, storm drains and water lines. **$100,000.** H. M. Gordon, Constr. Div., 713 Belvine Rd., engr.

●**Fla., Orlando**—City, exten. sewerage sy. over **$1,000,000.** Smith & Gillespie, Roberts Bldg., Jacksonville, consult. engrs.

Fla., Surfside (br. Miami)—Town, J. R. Johnson, clk., voted bonds, sanitary sewerage sys. **$700,000.** CD 1/7—ENR 1/22.

Kan., Coffeyville — City, exten. sanitary sewers in Edgewood Dist. **$100,000.** Patrick Smith, Coffeyville, city engr.

Mont., Bozeman—City, City Hall, sewerage sys. exten. **$250,000.** W. Babcock, Bozeman, city engr. CD 5/17/46—ENR 5/23/46.

N. J., Berlin—Berlin Boro, preliminary surveys sanitary sewerage sys., sewage disposal plant. **$600,000.** Paul X. Blattner, 101 Kings Hy. Haddonfield, consult. engr.

Okla., Ardmore—City, voted bonds, sewage disposal plant imprvs. **$150,000.** W. R. Holway, 302 E. 18 St., Tulsa, consult. engr.

●**Okla., Tulsa**—City, voted bonds storm sewer extens. **$1,148,000;** sanitary sewer extens. **$967,000.** Dan W. Patton, city engr. CD 12/30—ENR 1/22.

Ore., Lebanon—City, City Hall, election May 4 on special levy sewers and treatment plant. **$115,000.** L. R. Stockman, Baker, consult. engr. CD 5/13/46—ENR 5/30/46.

Pa., Scranton — Lackawanna Twp. Com., 2640 Pittston Ave., sanitary sewerage sys. in Minooka. **$223,700.** Gannett, Fleming, Corddry & Carpenter, Inc., 600 N. 21 St., Harrisburgh, consult. engr.

Tex., Gainesville—City, Wm. Lewis, mayor, sanitary sewers. **$100,000.** Wyatt C. Hedrick, Inc., Fort Worth Natl. Bank Bldg., Fort Worth, consult. engr. CD 8/16/46—ENR 9/5/46.

Tex., Houston—City, M. H. Westerman, secy., Sect. 1, Southmore-Westmoreland Diversion Sanitary Sewer Line, **$261,000;** Sect. 2, Southmore-Westmoreland Diversion Sanitary Sewer Line, **$234,000.** J. M. Nagle, city engr.

Wash., Bothell—City, City Hall, sewerage sys. and disposal plant. **$216,000.** Parker & Hill, Smith Tower, Seattle, Zone 4, consult. engrs.

Ont., Belleville—Thurlon Twp., c/o H. A. Harrison, Belleville, sewers and water services serving McDonald Ave. and Doctor housing site. **$250,000.** Gore & Storrie, 1130 Bay St., Toronto, engrs. CD 12/10/45—ENR 1/3/46.

Ont., Blenheim—Town, installing sewerage sys. About **$277,000.** Proctor, Redfern & McLaughlin, 36 Toronto St., Toronto, engrs.

Ont., Fort William—City, D. M. Martin, clk., installing sewers. About **$165,000.**

Ont., Nipigon—Nipigon Twp., W. L. Wade, clk., Nipigon, sewage disposal plant. About **$100,000.**

BRIDGES

PROPOSED WORK

●**Colorado** — State Hy. Dpt., Denver, widen bridge east of La Junta, State Hy. 6, F 1-5 (2), Otero Co., **$50,000;** bridge and gravel surfacing, Denver-Adams City, State Hy. 265, S-0065 (1), Denver and Adams Counties, **$150,000;** bridge and approach, Granada-North, State Hy. 51, S-0001 (4), **$250,000;** Holly-South, State Hy. 89, S-0003 (1), **$270,000;** both Prowers Co.; Franktown-East, State Hy. 86, S-0028 (1), Douglas Co., **$102,136;** bridge, Muddy Pass-Walden, State Hy. 14, S-0115 (1), Jackson Co., **$65,000;** Beshoar Junction-Walsh, State Hy. 100, S-0002 (4), **$55,000;** and SP 5-1-505, **$50,000** sboth Las Animas Co., west Grand Junction, State Hy. 340, S-0143 (2), Mesa Co., **$250,000;** State Railroad change, State Hy. 96, Pueblo, SP 2-96-505, Pueblo Co., **$100,000.** Mark U. Watrous, hy engr.

●**Colorado** — State Hy. Dpt., Denver, F. A. Secondary Bridge Project, south of Palasade, State Hy. 340, S-0145 (1), Mesa Co., **$200,000;** F. A. Underpass Project west of Arada; State Hy. 72, FAG S-137-6, (1), Jefferson Co., **$60,000;** F. A. Tunnel Project, Loveland Pass Tunnel, State Hy. 91, F 233 (14), Clear Creek and Summit Counties, **$1,000,000;** F. A. Overpass Project north of Colorado Springs, FAGH 276 (2), El Paso Co., **$60,147;** F. A. Bridges, widening Colorado Springs-Pueblo Rd., F 12-277 (20), El Paso and Pueblo Counties, **$133,775;** F. A. Bridge and Approach Project north of Burlington, State Hy. 51, S-001 (1), Carson Co., **$80,000;** F. A. S. Bridge, Approach, Curb-Gutter Project, Holyoke, State Hy. 14, S-111 (3), Phillips Co., **$50,000;** F. A. Grade Crossing Project, UGI 90 (4), **$500,000;** Valley Dr., FG 4-1 (1), **$588,835,** both Denver Co. Mark U. Watrous, hy. engr.

Ga., Atlanta—City, North Ave. underpass, **$330,000,** Moreland Ave. underpass. **$400,000.**

Massachusetts—State-County-City and Town Chap. 90 Project, 100 Nashua St., Boston, Belle Isle Bridge, Boston and Winthrop, Suffolk Co., **$100,000.** Three Rivers Bridge, Palmer, Hampden Co., **$104,000.**

O., Warren—Comrs. Trumbull Co., Warren, bridge, South St., SW. **$150,000.** Harry L. Dittmer, Warren, co. engr.

†**Wash., Hanford**—Atomic Energy Comn., Wash., D. C., bridge and access road between Richland and State Road 3. **$450,000.**

STREETS AND ROADS

PROPOSED WORK

●**Colorado**—State Hy. Dpt., Denver, grading, graveling Denver Colorado Springs Rd., State Hy. 1, FI 275 (15), Arapahoe and Douglas Counties, **$1,177,564;** Springfield-Walsh Rd., State Hy. 100, S 0002 (3), Baca Co., **$115,000;** Paonia-East Rd., S 0119 (2), **$150,000;** Delta-West Rd., State Hy. 6, F 19-1 (1), **$220,000** both Delta Co.; Dowd-Wolcott Rd., State Hy. 4, F 1-2 (3), Eagle Co., **$570,000;** Case-South Rd., State Hy. 19, F 19-2 (1), El Paso Co., **$248,000;** Gunnison-Almont, Rd., State Hy. 135, S 0119 (3), Gunnison Co., **$240,000;** Muddy Pass-Walton Rd., State Hy. 14, S 0115 (2), Jackson Co., **$300,000;** Morrison-Conifer Rd., State Hy. 1, F 193 (3) Jefferson Co., **$445,000;** Ft. Collins-East Rd., State Hy. 14, F 4-1 (6), **$440,000;** Poudre Cannon Rd., State Hy. 14, S 0104 (1), **$65,000** both Larimer Co.; Lewis-Dolores Rd., State Hy. 145, S 0156 (2), **$150,000;** Delores-Rico Rd., State Hy. 145, SP32-145-505, **$64,335** both Montezuma Co.; Lamar-Springfield Rd., State Hy. 50, F 28-2 (1), Prowers Co., **$375,000;** Range-Meeker Rd., State Hy. 64, S 0144 (2), **$290,000;** S 0144 (3), **$400,000;** S 0144 (4), **$600,000,** all foregoing Rio Blanco Co.; Monte Vista-South Rd., State Hy. 15, S 0113 (2), Rio Grande Co., **$185,000.**

Steamboat Spring-Hayden Rd., State Hy. 2, F 5-2 (2), Routt Co., **$730,000;** Wray-Nebraska Rd., F 11-1 (1), Yuma Co., **$163,000;** stabiling, oiling Walsenburg-Gardner Rd., State Hy. 69, S 0038 (2), Huerfano Co., **$200,000;** Trinidad-West State Hy. 12, S 0036 (1), Las Animas Co., **$170,000;** Placerville-Telluride, State Hy. 145, FLH 7 (1), San Miquel Co., **$112,337;** Julesburg-South Rd., State Hy. 51, S 0001 (3), Sedgwick Co., **$150,000;** Wray-South Rd., State Hy. 51, S 0001 (2), Yuma Co., **$150,000;** graveling, oil surfacing Springfield-Walsh Rd., State Hy. 100 SP 22-100-501, Baca Co., **$50,000;** Grand-Junction West Rd., State Hy. 340, S 0143, Mesa Co., **$200,000;** Linden-Idalia Rd., State Hy., 102, SP (19-27)-102-502, **$120,000;** oil surfacing, Estes Park-West Rd., State Hy. 16, F 211 (1), Larimer Co., **$50,000;** Lamar-Springfield Rd., State Hy. 59, F 2802 (2), Prowers Co., **$250,000;** Texas Creek-Hillside Rd., State Hy. 69, S 0038 (3), Fremont Co., **$120,000;** Moffat South Rd., State Hy. 17, S 0089 (2), Saguache Co., **$90,000;** grading, drainage, Clear Creek-Cannon Rd., State Hy. 20, F 5-3 (3), Jefferson Co., **$500,000;** curvature correction project east of Craig, State Hy. 2, Sp (28-42)-2-510, Moffat Co., **$50,000;** Owl Canon Alignment, State Hy. 123, F 4-1 (5), Weld Co., **$75,000;** grading, surfacing and bridge, Trinidad, U 12 (18) Las Animas Co., **$400,000;** curb, gutter, grading, surfacing in Greeley, State Hy. 3, U 6-1 (5) Weld Co., **$160,000.** M. U. Watrous, hy. engr.

●**Colorado**—State Hy. Dpt., Denver, grading, graveling Canon City-East Rd., State Hy. 6, F 1-3 (4), **$560,000;** FG 1-3 (1), **$276,000;** Canon City, State Hy. 6, U-1-3 **$57,746;** State Hy. 69, S 0038 (1) **$240,000,** all Fremont Co.; Valley Dr. F 4-1 (2), **$113,281;** Valley Hy., UI-90 (3), **$1,317,218,** both Denver Co.; FI-197 (2) **$175,000,** FI-197 (3), **$75,265,** both Pueblo Co.; Clear Creek Cannon, State Hy. 20, F 81 (12), **$100,000;** F 5-3 (1), same road **$300,000,** both Jefferson Co.; Frankstown South State Hy. 83, **$265,000;** FI-46 (5), Franktown & Colorado Springs, State Hy. 83, FI-46 (6), **$1,000,000,** both Douglas Co.; State Hy. 185, FI2-1 (1), **$280,000;** F 006-1 (6) **$240,105;** F6-1 (2), **$230,000,** all Weld Co.; between Wray-Nebraska State Line, State Hy. 54, FII-1 (1), Yuma Co., **$300,000;** Dowd-Wolcott Rd., State Hy. 4, FI-2 (2), Eagle Co., **$224,000;** Sugar City-Haswell Rd., State Hy. 96, S-46 (5), Crowley-Kiowa Co., **$300,000;** north of La Junta, S-116 (1), Otero Co., **$88,000;** west of Ft. Collins, State Hy. 14, S-0104 (1), Larimer Co., **$135,000;** Paonia-Hotchkiss Rd., S 0119 (1), Delta Co., **$595,129;** grading, graveling in Trinidad, UI 2 (16), Las Animas Co., **$250,000;** north of Denver, State Hy. 265, FI 2-1 (4), Adams Co., **$300,000;** oil surfacing Cowdrey-Wyoming State line, S-0103 (1) & S-105 (1), Jackson Co., **$112,000;** Ridgeway-Placerville Rd., State 62, F103 (14) & (15), Ouray Co., **$126,680;** paving F 21-1 (2), Montrose Co., **$150,000;** minor improvements, Pikes Peak Hy. west Colorado Springs, State Hy. 250, S-0092 (1), El Paso and Teller Co., **$65,000.** Mark U. Watrous, hy. engr.

Florida—State Road Dpt., Tallahassee, rebuilding Clark Rd., Sarasota Co. **$175,000.**

Florida—State Rd. Dpt., Tallahassee, rebuilding road 78, in Ft. Myers. **$120,000.**

Fla., Lakeland—City, street imprvs. **$150,000.**

Neb., North Platte—City, paving streets in 13 districts. **$300,000.** E. Y. Grupe, city engr.

●**Massachusetts**—State-County-City, Chap. 90, Project, 100 Nashua St., Boston, constructing, S. Walker St., Taunton; N. Main St., Fall River, **$60,000** each; Arcade Ave., Seekonk, Mt. Pleasant St., New Bedford; Pleasant St. Route 123, Attleboro, **$50,000** each, all foregoing Bristol Co.; N. Beacon St., Route 20, Watertown, Main St. Route 20, Waltham;